

Warbird Star:
Glacier Girl >>>



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AIR & SPACE

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IMMORTAL MUSTANGS

100 P-51s EXPECTED AT OHIO EVENT

*The
Country
Where
Nobody
Flies*

**Sputnik's
First Night:**
A MEMOIR BY
KHRUSHCHEV'S SON

**World's
Weirdest
Fly-in** p. 62

**Ice Fishing
on Mars**

North American P-51

AUGUST 2007

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ON THE COVER >>> To appreciate the elegance of the North American P-51's design, view it as Paul Bowen portrays this Mustang, owned and flown by Kermit Weeks: from above. "This is the kind of shape," its German-born designer once said, "the air loves to touch." For six more ways of looking at a Mustang, see page 40.



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On the Web www.airspacemag.com

HOW DOES THE INTERNATIONAL SPACE STATION dodge space junk? Why was Burt Rutan's Voyager asymmetrical? Do you really have to turn off your iPod on an airliner? For the answers to these questions and to ask your own, see "NEED TO KNOW."



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EDITORIAL: (202) 633-6070

e-mail: editors@si.edu

Web site: www.airspacemag.com

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What's New and What's Next

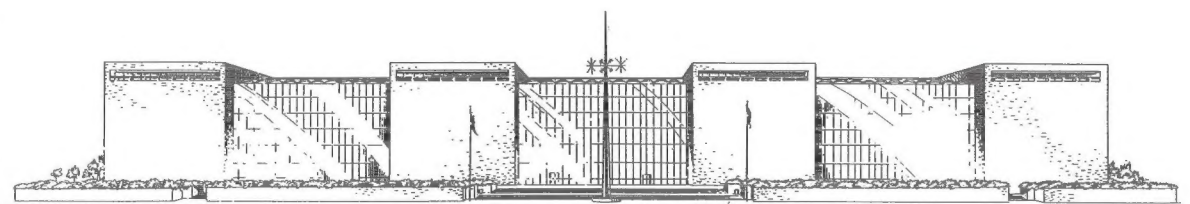
HOW DOES A MUSEUM protect and exhibit its historic artifacts and at the same time reflect current events, stay abreast of new discoveries, and present compelling programming? At the National Air and Space Museum, we rely on the guidance of the Public Programs Committee, 15 leaders representing every major curatorial, programmatic, and administrative division in the Museum. To coordinate work on major exhibitions, upgrades to galleries, educational events, community outreach programs, National Air and Space Society events, IMAX films, planetarium shows, and all the other activities with which we enlighten our visitors about aviation, spaceflight, and science, the Public Programs Committee evaluates each proposal to ensure that it furthers the Museum's mission and that the necessary resources are available to accomplish the proposed activity.

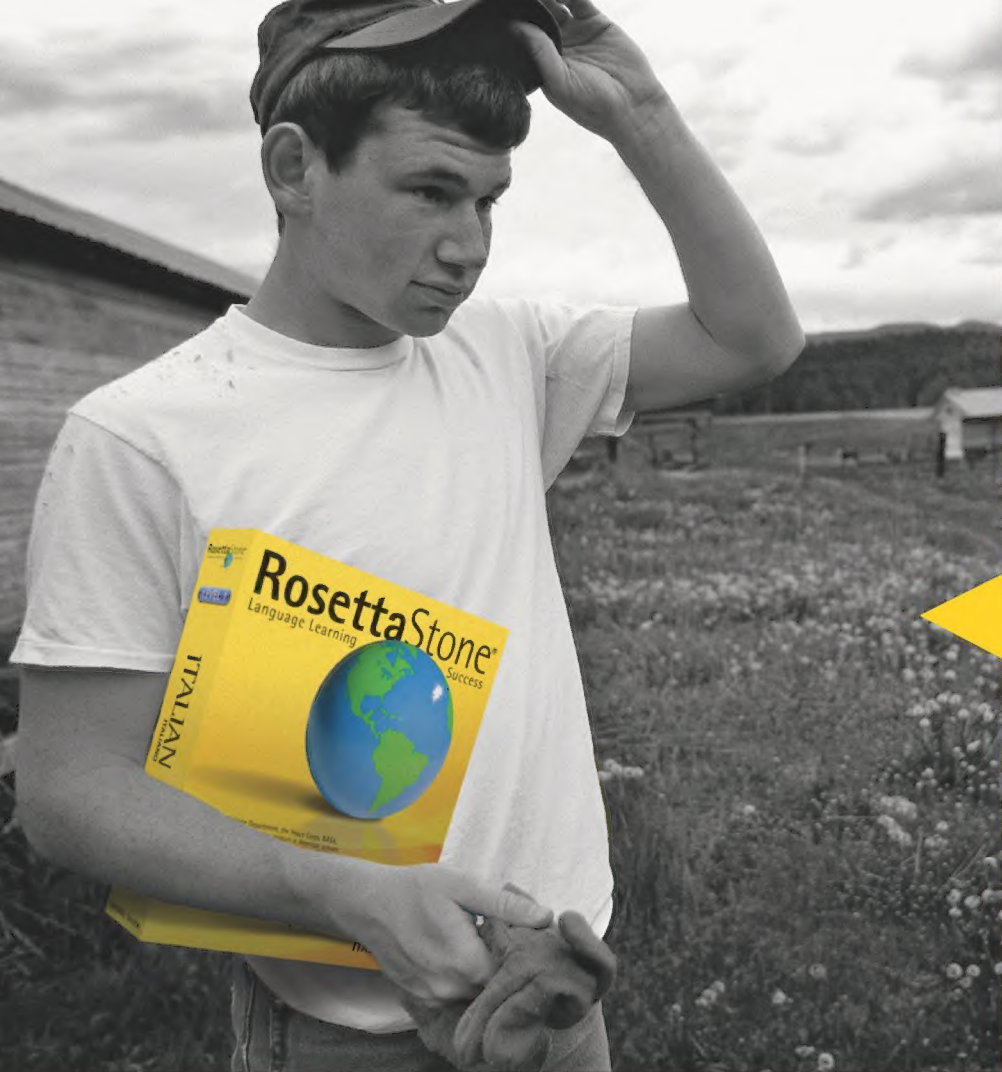
This is the mechanism we used, for example, to bring our visitors images from NASA's robotic rovers *Spirit* and *Opportunity* as they discovered in 2004 evidence that water once flowed on Mars. Today, if you visit the Exploring the Planets gallery on the second floor of the Museum on the National Mall, you will see these images as well as the artifacts that explain the history of planetary exploration. Thanks to one of many corporate contributors, you will also see, in one of the displays marked "What's New," current

telemetry from the Mars Odyssey spacecraft now in orbit around the Red Planet.

The Public Programs Committee meets monthly not only to react to discoveries and achievements in the many fields relevant to the Museum's collection, but to ensure progress on the major exhibitions planned over the long term. Currently, our exhibits, curatorial, and education departments are working to complete "America by Air," scheduled to open this November. A history of air transportation from the early years of airmail to today's jetliners, this gallery has been in the works for many years. As we complete work on "America by Air," we are also looking forward to presenting a new exhibition in collaboration with the National Museum of American History entitled "Finding Time and Place." Scheduled to open in 2010, provided that we are successful in our fundraising efforts, the exhibition will tell the story of the crucial role of timekeeping in navigation over the past 300 years. As we plan exhibits, outline educational programs and publications, and create activities related to this new exhibition, the Public Programs Committee continues to review short-term proposals. Coming up next: the annual "Air and Scare Night" at the Steven F. Udvar-Hazy Center at Dulles International Airport.

■ ■ ■ J.R. DAILEY IS THE DIRECTOR OF THE NATIONAL AIR AND SPACE MUSEUM.





He was a hardworking farm boy.

She was an Italian supermodel.





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Ghost Story

"Flight Lines" (June/July 2007) brought to mind an incident from 1968, when I was over the western Pacific Ocean in a KC-135 tanker. We were returning from a dawn-patrol sortie that had us refueling B-52s headed for Vietnam. We were near the Philippine island of Luzon, at something like 41,000 feet. The sun was just coming above the horizon when the pilot called to me, "Nav, look at this!" I went up to between the pilots; in front of us a contrail had popped out of a lower cloud deck. It was rising like a rocket and on a head-on course. It quickly passed our altitude and climbed on. I couldn't see what was making the contrail, but it had to be as high above us as we were above the ocean—i.e., perhaps 80,000 feet. There was only one thing capable of that in 1968: an SR-71 Blackbird. Even in tropical air and at that extreme altitude, an SR-71 was making a contrail.

Gerald P. Hanner
Papillion, Nebraska

Job No. 1: Fix Earth

In philosophizing on our space exploration program ("The Real Reasons We Explore Space," June/July 2007), NASA Administrator Michael Griffin piously claims the reason that will endure a thousand years lies in the value of the knowledge gained. It is incomprehensible then that Griffin would slash NASA's Earth science program, which gives us crucial information about the reality of global climate change, knowledge that would help us here on Earth to survive the next 50 years.

Thomas R. Smith
San Diego, California

Accident in Antarctica

Carl Hoffman's "Buried at the Bottom of the World" (June/July 2007) is confusing: If radar returns were "clear and strong,"

why did the pilot of *George One* fly into a mountain range? Why was radar operator Robbie Robbins "standing between the pilots on the airplane's flight deck"? I doubt that's where the radar set was. And why did the pilot make "a long, slow 180-degree turn" toward the mountains?

Lee Steele
Mountain View, California

Carl Hoffman replies: The mountain into which George One crashed was uncharted and did not appear on Robbins' radar, which, based on his extensive experience in the Arctic, seemed to be working well. At the time of impact, Robbins had just "stood up to see if anything was visible," so he was between the pilot and copilot "with only very little lean-forward," and with the radar at his left hip. Since the mountain was unseen, undetected, and uncharted, the crew had no idea they were turning into it. Still, Robbins says: "I have worried about being at fault for years, and I was not buckled down as I should have been."

If money is the only thing in the way of recovering these service members, has anyone thought to ask Microsoft co-founder Paul Allen? I don't think he would blink at donating two or three million dollars to a recovery effort.

Mike Reuss
St. Paul, Minnesota

The 51st Way

The National Association of Rocketry is celebrating the 50th anniversary of both the space race ("50 Ways to Space Out," June/July 2007) and the NAR founding with a special program: Any child under the age of 16 may fly a model rocket at any NAR-sponsored launch and receive a certificate marking the child's first model rocket flight. To find an NAR section near you, visit www.nar.org/NARseclist.php.

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Brian Grote is a flight instructor with 20 years aviation experience. He also writes monthly columns on subjects pertaining to aviation.

FLYBY

ARTICLE WRITTEN BY: BRIAN GROTE

Dear Brian,

I've been flying for over 20 years. My usual run is a Denver departure at 9pm, fly to Billings, on to Cheyenne and then back to Denver by 5am. I fly a King Air 350. I love my career and I pride myself on doing the best job I possibly can.

Last time out, however, I was making lots of little mistakes. I was cleared for the ILS Runway 35R into Denver, but I couldn't pick up ATIS. That's when I looked at my radios and noticed I had dialed in the wrong frequency. I glanced again and dialed in the right frequency. I continued through my checklist and set my Radar Altimeter to 5500 feet. I was ready to make my descent and start my approach. After the outer marker I glanced at my DH again and noticed that I had set my Radar Altimeter, 67 feet low. Luckily, I landed safely, bouncing the wheels just a little.

After a couple more days in the sky I could tell my eyesight was beginning to deteriorate. I knew I wouldn't be able to renew my first class medical if I didn't do anything about it. I was really worried and started asking my peers if there was anything I could do. A co-worker gave me a bottle of Claroxan™ and told me it would help me maintain my depth perception. I was skeptical at first, but tried it anyway. As it turns out, the stuff works great. The problem is, I ran out and don't know where to find more. Have you heard of this Claroxan™ stuff? Is it available in the States?

Jason, 46 – Seattle, WA

Jason,

Not only do I know of Claroxan™, it just so happens I take it everyday. Being a pilot myself, I know that perfect visual acuity is an asset none of us can afford to lose. That's why every pilot should be protecting their eyesight before it's too late.

Claroxan™ contains ingredients proven beneficial for the eyes. Among these ingredients are lutein and zeaxanthin – powerful antioxidants that have been clinically proven to protect the retina and macula and, in some cases, reverse the damaging effects of macular degeneration. These antioxidants block damaging UV rays and halt damaging free radical oxidation in the back of the eyes. They have also been clinically proven to decrease the risk of cataracts.

Claroxan™ also contains bilberry, an anti-oxidant known to improve night vision. Bilberry's night vision enhancing effects were first noticed in England in the early 1940's. The RAF ordered English fighter pilots to eat bilberry jam on toast figuring it would give them an advantage during night raid missions against the German Luftwaffe fighters.

Claroxan's unique proprietary formulation is completely safe, all-natural and extremely affordable. As far as ordering it, you can call them toll-free at 866.775.3937, or go to www.claroxan.com. I usually get mine within a week after ordering.

Hope this helps!
Brian

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The Himalayan Cataract Project strives to eradicate preventable and curable blindness in the Himalaya through high-quality ophthalmic care, education, and establishment of a sustainable eye care infrastructure.

Based in Asia, at Kathmandu in Nepal, the Project is empowering local physicians to alleviate the suffering caused by blindness through unique programs including skills-transfer education, cost-recovery, research, and the creation of a world-class network of eye care facilities.

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Visit CureBlindness.org to learn more about HCP.



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Sunlight, aging, and diet each cause damage to the retina and macula, which can lead to a decline in vision that glasses or contacts can't help. If you've experienced an increase in blurriness or difficulty seeing details at any range, then you know how valuable sharp vision can be. What you might not know is that in the past three years, a flood of new scientific research has been done on natural vision enhancement. This medical research suggests that ingredients in Claroxan™ may help maintain and even improve your vision, while at the same time giving you added protection against many ocular diseases.

Claroxan™ may improve macular pigment density, which research shows has amazing effects on vision. By improving macular pigment density, ingredients in Claroxan™ may improve normal

visual acuity, contrast sensitivity, and even glare reduction. Participants in one clinical study reported that ingredients in Claroxan™ improved their long range vision outdoors – in some cases, they were able to distinguish far away ridges up to 27 miles further than normal! Even if you have perfect vision now, Claroxan™ may help give you an edge by improving your visual reflexes and may allow you to pick up on moving objects faster than ever before.

People who count on their vision – people like pilots, hunters, military, and even pro athletes – trust Claroxan™ as the best source available for vision enhancement and protection. Claroxan™ is safe, effective, and extremely affordable. However, people with serious health concerns should consult a doctor before use.



Letters

Why Do We Search?

Every five years or so, someone has a new ridiculous theory about the disappearance of Amelia Earhart and Fred Noonan ("An American Obsession," June/July 2007). Now it's that they had enough fuel to land on some island other than Howland. But the others were coral outcroppings or covered with vegetation. How do I know? I was a member of the Marine detachment on the USS *Colorado* when we were suddenly ordered to steam from Hawaii to the Phoenix Island group to aid in the search. If 10 ships and

65 airplanes couldn't find any trace of Earhart's airplane in 16 days, how can a puny expedition mounted 70 years later come up with something? As far I am concerned, that's the only mystery.

James R. Leard
Klamath Falls, Oregon

Correction

June/July 2007 Cover: The photograph should have been credited as NASM (SI neg. #A-45905-C).

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Business Is Booming

>>> IF THE F-104

Starfighter were a car, it would likely be a Corvette Sting Ray: sleek, aggressive, wicked fast, but well past its prime. So it might come as a surprise that NASA has called on the iconic cold war-era fighter, created in the early 1950s by famed Lockheed designer Kelly Johnson, to conduct a series of environmental impact studies at Kennedy Space Center in Florida.

The agency wants to host commercial spaceflights that would launch from and land horizontally at its 15,000-foot Shuttle Landing Facility once the space shuttle retires in 2010. In the interest of being a good neighbor, NASA first wants to make sure that returning spacecraft won't create dish-rattling sonic booms over the Space Coast.

That's where Starfighters Inc., an airshow team based in Clearwater, Florida, comes in. "We're flying the same or similar profiles that suborbital vehicles will fly when returning to the Cape," says team creator Rick Svetkoff, a former A-4 and commercial airline pilot who began flying F-104s at airshows in 1995 (see "The Fastest Show on Earth," Apr./May 2001).

"You have to climb almost straight up to 40,000

feet and then roll over on your side and go supersonic by the 12-mile point," says Svetkoff, 12 miles being the distance from the Cape where commercial spacecraft are expected to exceed Mach 1. "There aren't many planes that can do that." Indeed, the Starfighter is so powerful that Svetkoff had to kill the afterburner to keep from going supersonic before the checkpoint.

On the first of two runs last April, Svetkoff looped out over the Atlantic, then began the steep descent that commercial vehicles will make when returning from space. "At 40,000 feet, I'm looking almost straight down at the runway," says Svetkoff, who puts the fighter down at 230 mph.

The outcome was the best one possible: silence. "No one at the [landing facility] heard a thing,"

Svetkoff says. "It shows that, yes, this is something we can do out of KSC—you can run viable supersonic operations as long as you set them up on an existing profile."

So how long will it be before commercial spaceflights begin at the center? "I think the technology has to mature on the industry side," says Jim Ball, spaceport development manager at KSC. "However, as soon as we complete the

environmental assessment, there would be nothing preventing us from hosting those flights from here, provided NASA is comfortable with the arrangements we make with a provider, and that its launches are sanctioned by the Federal Aviation Administration." Future F-104 sorties will research telemetry and communications systems and validate suborbital flight operations.

■ ■ ■ MARK CANTRELL



Rick Svetkoff (top) talks to the press at Kennedy Space Center, where he makes sonic booms in his F-104 for NASA.

Airborne Once Again

>>> **THIS SUMMER**, visitors to the Fighter Collection at Duxford, England, are getting the first public look at one of the rarest of U.S. World War II aviation icons, a Curtiss P-40B Tomahawk, buzz number 284. It's the only one in existence, and, remarkably, it is flying.

When the Japanese attacked Pearl Harbor, the brand-new P-40Bs had just become the nation's frontline fighters. Number 284 survived the attack because it was down for repairs to its landing gear. On January 24, 1942, Lieutenant Kenneth Sprankle took it up, stalled out of a slow roll, and spun into a mountain on Oahu. The airplane, which had flown only 56 hours, was abandoned. Soon the P-40Bs were eclipsed by advanced fighters, and within a few years all had disappeared into scrap yards.

Kent Lentz, an aerospace machinist and World War II history buff, knew that

none existed, but, he says, "I had a photograph of an early P-40 on my wall. I prayed, *Lord, let me be instrumental in bringing back one of these airplanes, because it is a very important piece of American history.*"

Through a chance meeting in 1989 with ace Chuck Older, a former American Volunteer Group Flying Tiger, Lentz met Mike Fortner, a retired Air Force technician who shared his passion. After 17 years of searching, Fortner had ferreted out the wreckage of 284 and had had the pieces shipped to California. Together they launched a worldwide

search for parts. One trip took them into California's High Sierra mountain range to salvage the remnants of two early P-40s that had crashed on a training mission in 1941. An Allison engine was obtained from a California collector who had purchased it as surplus.

The restoration had been under way for 10 years when Mike Fortner died. A supporting group, Project Tomahawk, could no longer raise enough money to keep the project going. Then Stephen Grey, whose Duxford, England collection holds an incomparable batch of

A Curtiss P-40B now flies at the Fighter Collection in Duxford, England.

World War II aircraft, rode to the rescue. In 2001, the project moved to the California Aero Fab shop, where a restoration of Grey's Curtiss Model 75 Hawk was in progress.

On January 12, 2007, almost 65 years to the day after Sprankle's crash, Steve Hinton, president of the Planes of Fame museum in Chino, California, took 284 up for its first flight. There was a little oil problem with the engine, he reported, but otherwise it flew just fine.

■ ■ ■ MARSHALL LUMSDEN



Blue Moon

The moon is invariably characterized as consisting of many shades of black and white. Most astrophotographers image the moon in gray scale, reinforcing the notion that the moon is monochromatic. Nevertheless, Apollo astronauts as well as ground-based observers have reported seeing color. Careful inspection of lunar images supports subtle coloration.

Most color lunar images are actually multiple monochrome images combined into single ones, with false color exaggerated through photographic filters. Mine is a single red-green-blue image in which I tinkered with the saturation (and slightly with the hue) to bring out the moon's true colors.

Blue areas are associated with high titanium content; orange areas indicate aluminum and iron. Titanium tends to bind with available oxygen, and future habitation may require mining and processing oxygen.

■ ■ ■ ANTHONY AYIOMAMITIS



Sightings

PICTURES WORTH A SECOND LOOK



THE WORK OF WISCONSIN-BASED PHOTOGRAPHER JOE OLIVA immerses viewers in the grace and power of military aviation. Frequently embedded with the Wisconsin Air National Guard, Oliva has captured some of the Air Force's most striking assets in flight.

A B-2 stealth bomber soaring over the foothills of the Rocky Mountains (above) embodies a common theme of Oliva's work: the mix of mechanical and natural beauty. Unfortunately for Oliva, the working conditions needed for making these shots do not match the imagery's sense of space and splendor.

During the B-2 flight, Oliva was crammed in the rear of a KC-135 Stratotanker, lying face down on a specially designed seat used by the refueling boom operators who control the fuel transfer. "During the process we can cover several hundred miles, especially with a large aircraft that can take a lot of fuel, or if it is a training mission the receiver may be doing several hook-ups," he says. As for the above landscape,



"I think we are over Colorado," says Oliva, "but it is possible we are over Utah."

He captured a pair of F-117 stealth fighters (above) near Roswell, New Mexico, as part of a training mission with the Wisconsin Guard's 128th Air Refueling Wing.

"I was actually in the cockpit of the KC-135, squeezed behind the copilot's seat, shooting out of the cockpit side window," Oliva recalls. Because the photograph does not show a horizon or a terrestrial background, the two stealth fighters appear to be suspended in a void. The shot highlights their extraordinary geometry.

A different perspective on Oliva's working conditions is seen in his overhead shot of the 136-foot-long KC-135 (top), the type from which he takes many of his pictures. During a National Guard open house, interested guests appear diminutive as ants next to the Stratotanker's bulk.

In the Museum

STOPS ON A TOUR THROUGH AMERICA'S HANGAR

A Bonanza Anniversary

WHAT IF ALL IT TOOK to achieve world peace was a flight around the world? In 1951, a Republican Congressman from Illinois, Peter F. Mack Jr., believed it was possible to spread goodwill by circling the globe in an airplane. His first challenge was finding an airplane suitable for the trip. Paul Garber, then curator of the Smithsonian's National Air Museum (as it was called), offered to loan Mack one from the collection: a peppy little Beech 35 Bonanza with the clever name *Waikiki Beech*.

Both Beech Aircraft Corporation and the Bonanza it manufactures are celebrating anniversaries this year. The corporation (now owned by Raytheon) was founded in Wichita, Kansas, by Walter and Olive Ann Beech 75 years ago. And the highly successful Bonanza, which first flew in 1947, is celebrating 60 years.

Part of what makes the Bonanza



distinctive is its V-shape tail. The design was thought to act as both a vertical and a horizontal stabilizer, but with fewer parts and less weight. At first, it also seemed as though the V-tail provided greater flight control response than a standard rudder and elevator, but after several accidents related to control issues, the design was modified. The standard-tail, six-seat Bonanza 36 came out in 1968, and is still in production today.

The *Waikiki Beech*, the fourth Bonanza off the production line, set two distance records. In January 1949, piloted by Captain William P. Odom,

Shiny, happy Bonanza: Captain William P. Odom's *Waikiki Beech* (opposite) took him nonstop from Hawaii to New Jersey in 1949. Above, his classic four-seat V-tail shows off at the Hazy Center.

the *Waikiki Beech* became the first light airplane to fly from Hawaii to the continental United States (2,900 miles). In March of the same year, Odom flew from Honolulu, Hawaii, to Teterboro, New Jersey—5,273 miles—setting a nonstop distance record of 36 hours and one minute.

Congressman Mack paid \$3,200 to have the *Waikiki Beech* reconditioned

ARTIFACTS

Belated Honors

ALTHOUGH THE TUSKEGEE AIRMEN HOLD an honored place in history, they had never been formally recognized for their contributions to the U.S. Army Air Forces in World War II. After more than 60 years, the nearly 1,000 African-American men who trained in Tuskegee, Alabama, to become fighter pilots were finally awarded the Congressional Gold Medal (most receiving the medal posthumously). It is the highest civilian award bestowed by the U.S. Congress, and was presented collectively, in March 2007, to the 300-plus surviving Tuskegee Airmen. The Airmen were segregated from their white counterparts during both training and the war, and were subjected to constant racism and criticism. And yet they defended their country bravely. Between 1941 and 1946, the Tuskegee Airmen flew 15,000 missions and downed 400 enemy aircraft in campaigns ranging from Europe to North Africa.



Tuskegee Airmen received bronze replicas of the Congressional medal. The gold original is in the Smithsonian.



TOP: DANE PENLAND

at the Beechcraft plant in Wichita. Rechristened *Friendship Flame*, the Bonanza took off from Springfield, Illinois, with Mack at the controls, on October 7, 1951.

Mack spent three and a half months traveling through 30 countries, logging 223 hours of flight time. *Friendship Flame*, equipped with extra wing and fuselage tanks, carried 268 gallons of fuel (compared to its usual load of 40 gallons).

According to Mack, who wrote an article about his trip for *Collier's* magazine in 1952, "at 18 miles per gallon, my tiny aircraft could travel nearly 5,000 miles without refueling—or more than the range of a B-29."

The Congressman's wife, Ramona, whom he met in 1954, says her husband "enjoyed the [Bonanza] very much," although he didn't often discuss his global trip. Briefly, in the 1970s, Mack co-owned a Bonanza.

Mack never achieved the world peace he sought, but the airplane was

[Visitor Information]



Docent Tours Docent-led tours highlight the Museum's collection and trace the history of air and space travel. Tours occur daily at 10:30 a.m. and 1 p.m. At the National Air and Space Museum on the Mall, meet at the Welcome Center. At the Steven F. Udvar-Hazy Center, meet at the Docent tours desk in the Boeing Aviation Hangar.



What's Up Receive regular updates on Museum events, read about artifacts, get detailed (and behind-the-scenes) exhibition information, and receive calendar listings by subscribing to the National Air and Space Museum's free monthly e-newsletter, *What's Up*. Sign up at www.nasm.si.edu.



Star Party Join National Air and Space Museum staff astronomer Sean O'Brien on Saturday, August 11, in observing celestial objects in dark skies unpolluted by city lights (with a little help from some high-powered telescopes). Sky Meadows State Park, Virginia, 8:15 p.m. to 11 p.m. Parking fee: \$4 per car. Park phone no.: (540) 592-3556.



Summer Exhibits Catch "Fly Now" – a colorful history of how the airlines have used posters to market their routes – at the National Air and Space Museum before the exhibit closes on Aug. 31. The entire collection of posters is available in a book by Museum curator Joanne Gernstein London. "Airborne Dreams," at the Hazy Center, highlights Japanese-American flight attendants for Pan American World Airways in the 1950s. Learn their story through exhibits of their uniforms, flight bags, and personal scrapbooks.



In 1951, a Republican Congressman from Illinois, Peter F. Mack Jr., believed it was possible to spread goodwill by circling the globe in an airplane. Paul Garber offered to loan Mack one from the Museum's collection: a peppy little Beech 35 Bonanza named *Waikiki Beech*.

assured its place in history. In 1975, *Waikiki Beech/Friendship Flame* was refurbished again and placed back in the National Air and Space Museum—its two names imprinted on opposite sides of the fuselage.

General Jack Dailey, director of the National Air and Space Museum, is a great fan of the Beech Bonanza. He purchased a 1985 F33 (the model in the Museum is a 35) four years ago and equipped it with a 300-hp Continental

550 engine. "I've always wanted to fly a Bonanza," says Dailey. "It's easy to fly, comfortable, and rugged." Dailey, a retired Marine aviator with 7,000 flight hours, flew T-34s (a military version of a Bonanza) when he was a recruiter in Michigan, offering rides to students enrolled in aviation programs at local colleges and universities.

"That's where I got introduced to Beechcraft," he says. "I could take that plane anywhere and land it anywhere." In lieu of navigational aids, Dailey used a highway map to get around, and flew low enough to read the road signs so he knew where he was. "I would land in a farmer's field, taxi up to the house, and ask if I could operate out of there for a while," Dailey says.

The Bonanza, for Dailey as well as for many other pilots, represents a bygone era of aviation. "It kind of takes you back to the days when the country wasn't in a hurry," says Dailey. "They were interested in your airplane. You landed at a little field and they would invite you to lunch."

BETTINA HAYMANN CHAVANNE

Above & Beyond

MEMORABLE FLIGHTS AND OTHER ADVENTURES

Lightning, Smoke, and Fire

IN THE SPRING OF 1945, two aging RP-38E Lightnings, veterans of the 1943 Attu-Kiska campaign to drive the Japanese out of the Aleutian Islands in the north Pacific, were delivered to our 11th Fighter Squadron on Adak Island. The plan was for us to use these old ships for training; later, after picking up brand-new P-38Ls at Anchorage on the mainland, we were to fly to Shemya Island near Attu to attack the Japanese-held Kurile Islands.

I had been flying P-40Ns out of Adak since September 1944. My first three flights in the P-38E were not bad, though it was a totally different machine from the P-40N. The Lightning's counter-rotating props provided superb stability and negated torque, so there was no need to ride the rudders as in the P-40. Landings were easier because you could actually see the runway, whereas the P-40's long nose hid everything when landing. But it was also a more complex aircraft: two throttles, two mixture controls, two prop speed controls. I had a lot to learn.

One May evening I decided to go up after supper (the sun would stay up until after 9) and was airborne about 8 p.m. I flew a wide circle north around Mount Moffet, then west over Kanaga Island, and finally turned east at 8,000 feet. I was practicing single-engine procedures and had turned off

my left engine and restarted it. As I crossed the coast of Adak, I heard a muffled *bang*, and looked out to see the left engine on fire, with a big hunk of cowlings gone, and heavy black smoke pouring out. I quickly shut down the engine and feathered the prop, but the fire continued to burn.

Immediately smoke filled the cockpit, so thick that I couldn't see through the windshield. I called, "Adak Tower, Adak Tower, this is Tripod 41, coming in for emergency landing. Mayday, mayday." At this point I was perhaps two miles from the base, but knew that I was never going to make it—with the smoke in the cockpit I was virtually blind. I could hear the tower controller calling, "Tripod 41, Tripod 41, come in please, you are cleared for emergency landing." He sounded frantic.

At this point, panic was exceedingly high, and my body was as tense as steel wire.

Still, I can remember thinking how ridiculously close my predicament was to that of the pilots in the old movie *The Dawn Patrol*, as their cockpits filled with smoke while they gallantly waved to their buddies and slid into their last twisting spiral dives to the ground.

There was a certain macabre humor to the scene.

Immediately taking action to bail out, I loosened the latch of the top canopy, which then began slamming up and down, banging me on my head. I had already determined that if I ever had to bail out of a P-38 I would roll the ship over and fall out, rather than risk sliding off the wing and under the tail boom. So I pulled the nose up

slightly and tried to roll to the right, so as to have the fire over rather under me. But it would not roll right; the combination of the torque of the clockwise-spinning right prop and the dead left engine blocked me.

So, you don't want to roll right, we'll roll left. Again, with the nose up I rolled neatly over to the left, steadied in the upside-down position, and unsnapped my seat belt. I fell part of the way out, but the slipstream pinned me against the back of my seat. By this time I was beyond fear. Grabbing the sides of the cockpit, I pulled myself back in, legs tucked under me, shoes on the seat. Then I gave a gigantic leap and burst out of the airplane.

Falling at perhaps 200 mph is like being a rag doll in a hurricane. I actually thought of that image at the time. My helmet was gone, and my arms and legs flailed. I started to count to 10, but at 7, curiosity got the better of me and I reached down and pulled the ripcord.

I glimpsed something white out of the corner of my eye, and then *bang*, the chute opened. My curiosity satisfied, I floated down into a cloud. This must have been at about 6,000 feet.

In the finale of the P-38's split-S, I heard it going *ryryryryngryng*, followed by a colossal *whomp* as it hit the ground. I was told later that the crash cleared people out of two movie theaters and that Adak Tower had broadcast, "Creighton has bailed out over the cone." But they were wrong: I was four miles from the cone (the radio navigation station), and right on the lower flanks of Mount Moffet, within a mile of our squadron's base.

In the clouds the turbulence was so bad that my chute swung me back and forth wildly; at the extremes of each swing it partially collapsed. I tried desperately to pull the risers to dampen the swings, but that only made it worse, so I abandoned the

Immediately smoke filled the cockpit, so thick that I couldn't see through the windshield. I called, "Adak Tower, Adak Tower, this is Tripod 41, coming in for emergency landing. Mayday, mayday."

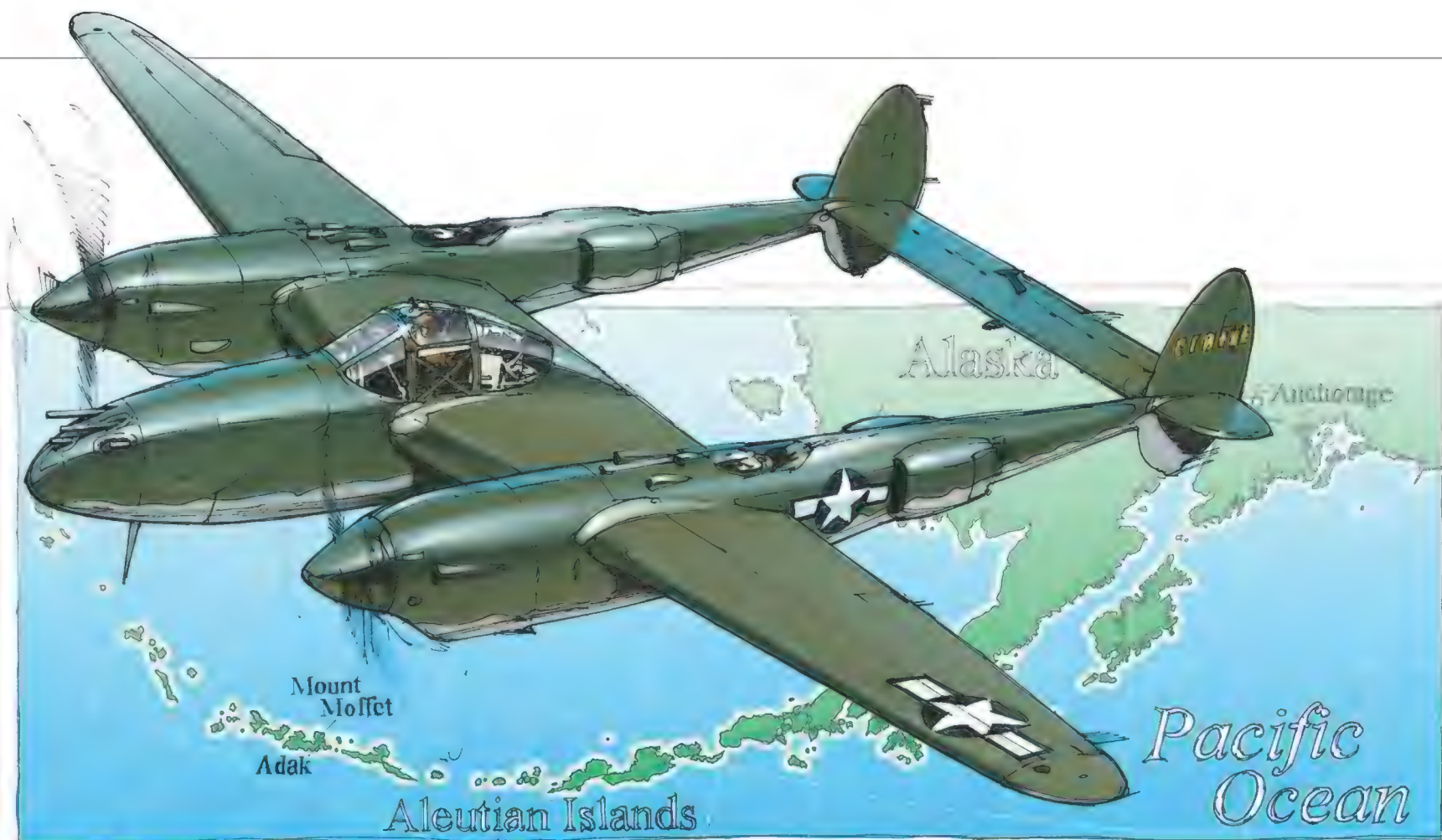


ILLUSTRATION BY HARRY WHITVER

struggle, thinking, *The good Lord got me this far, He can jolly well get me the rest of the way down.* Which was, apparently, what happened: I emerged from the clouds at about 2,000 feet above the ground, and the gyrations slowed.

Then, more trouble. My squadron mates, in P-40s, attracted by the radio fuss, came roaring in to see if I was all right. I tried to wave them off, shouting for them to get the heck away from me. Fortunately this did not last long, as I was dropping fast.

Because the wind was strong, I prepared for landing by squiggling my fanny back into the sling formed by the harness, then undoing the leg straps and finally the chest strap. I could see soldiers running around below, dozens of them, and in short order I landed on soft tundra. The chute gave a final tug that stretched me out flat on my face. Someone came running up, saying "Are you all right, sir?" I gave him two seconds to worry, then wriggled backward out of the harness and stood up, with men crowding around me.

I had come down a hundred yards from where the airplane had augered in. Gasoline and tundra were burning briskly, sending up a good column of smoke. Ammunition was exploding

sporadically, and fire trucks were arriving with sirens going. More P-40s arrived and buzzed us at an altitude of 50 feet. I had never appreciated the impact of buzzing on ground troops. It was frightening, but it was also a great show.

Someone rolled up my chute, and I started walking bare-headed down the hillside, feeling tall and incredibly strong, like a giant. People looked at me as if I were a genie. But soon Doc Braun and a fellow pilot named Sharp captured me and took me back to the squadron in their jeep. Doc Braun gave me a triple shot of whiskey and two capsules that would have choked a horse. Then our commanding officer came in with his executive officer and interviewed me while I was lying flat in bed, still in a state of shock.

The next day a buddy drove me up the mountain to the site of the crash, now a hole about 10 feet deep and 20 feet across, with the tundra burned black for a hundred feet around. There were bits and pieces of the airplane strewn all over the place. I looked for souvenirs and found one crumpled round of .50-caliber ammo, and my seat belt buckle, with a piece of the canvas belt in it, burned. A bulldozer began to fill in the hole.

A few days later I was ordered to

report to our commanding officer's hut and found him and our executive officer with three or four other men in civilian clothes. On an island with 25,000 men in uniform, I wondered if they were feds in disguise. They wanted to question me because my airplane crashed within a mile of 11th Air Force headquarters, and they wondered whether it was really necessary for me to bail out so close to the base. I excused myself and returned with the flight jacket I was wearing when I crashed. The left sleeve was burned from wrist to elbow. That brought the interview to a quick end.

In the days following the accident, nothing was said to me about going back up in a P-38, either by Doc Braun or any of the squadron top brass. But after seven days, back on flight status, I got into a P-38 and taxied to the end of the runway. I had heard of people breaking out in a cold sweat, and as I moved into takeoff position, that's exactly what happened: Fear grabbed me like a vise, and drops of perspiration broke out all over my forehead. But I knew that I could not live with myself if I gave in, so I tensed up, gave it full throttle, and climbed into the sky.

R.L. CREIGHTON

Oldies & Oddities

FROM THE ATTIC TO THE ARCHIVES

Broadcast Bomber

STRATOVISION HAD ONE brief shining moment: On June 23, 1948, the system's airplane-borne TV transmitters rebroadcast the Republican National Convention in Philadelphia to the nine-state area around Pittsburgh, with a demonstration for reporters in Zanesville, Ohio. "Stratovision is a reality with future unlimited," cheered the *Martin Star*, a publication of the Glenn L. Martin Company, which, in a partnership with Westinghouse, had backed the system.

Westinghouse electrical engineer Charles E. Nobles developed Stratovision as a way to transmit television and FM radio programs to a wide audience. The underlying problem, the *Martin Star* explained, was that waves in the very-high-frequency bands used by TV and FM travel in a straight line from the transmitting tower and, unlike AM signals, do not conform to Earth's curvature. Therefore, the horizon as viewed from the tower was the limit at which TV or radio could be heard—50 to 100 miles in diameter, depending on antenna height.

Nobles, a radar expert, told Westinghouse that he realized "the possibilities of television and FM radio operation, since both have characteristics similar to radar, from an airplane," particularly given an airplane's altitude, flying in "lazy circles" high above Earth. Nobles said that an airborne signal could extend to 211 miles in one direction, compared with 50 miles from a transmitter atop the Empire State Building.

Nobles predicted Stratovision would deliver TV and FM to "small town and farm homes." Thus the focus on Zanesville, population 38,000, with the nearest TV service at Cleveland and Cincinnati, both 100 miles distant.



Three years of flight testing had preceded Stratovision's debut, with some early tests using a Lockheed PV-2. Before its Zanesville triumph, the system underwent several test flights and broadcasts from a Boeing B-29 Superfortress. Results showed a good signal could be broadcast from 25,000 feet to an area up to 525 miles in diameter. A Youngstown, Ohio viewer wrote to Nobles: "Reception was good, contrast excellent, sound excellent, and a slight shakiness in picture."

For the June demonstration, Westinghouse and Martin flew reporters to Zanesville. They watched the broadcast at the Zanesville Country Club, where TV sets had been installed for the occasion.

A B-29, orbiting 25,000 feet above Pittsburgh, rebroadcast the Republican convention directly from WMAR-TV in Baltimore, 9 to 10 p.m. EDT. The bomber was outfitted with an eight-foot mast on its vertical stabilizer to receive programs; the signal was sent from the antenna to the cabin, and on to the broadcast antenna. The antenna, stored horizontally in the bomb bay, projected 28 feet down when operating.

After the convention transmission, Martin and Westinghouse

The tail antenna received programs from ground stations; the bomb-bay antenna broadcast them up to 525 miles.

representatives trumpeted Stratovision's future. They foresaw a nationwide Stratovision network, with programs beamed from one airplane to the next. Fourteen airplanes could bring TV and FM radio to 78 percent of the population; a comparable ground installation network would require more than 100 relay points, Westinghouse estimated. A fleet of 60 Martin 202 airliners would suffice.

A January 1949 Martin press release declared Stratovision "ready for commercial development," but its stellar prospects were dimming. In August 1948, Westinghouse had petitioned the Federal Communications Commission for a permit to launch the first Stratovision station, operating near Pittsburgh. The following month, the FCC, wanting to examine signal interference between stations, put a freeze on new permits.

In 1949, AT&T set up a coaxial cable network to connect the East Coast with the Midwest, largely through underground wiring. Westinghouse dropped Stratovision in 1950.

MARGARET MOEN



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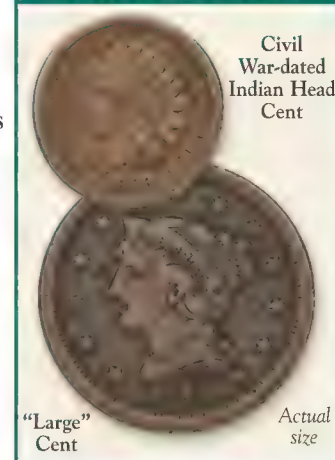
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ANY VISITOR TO AN AVIATION MUSEUM has probably had the same experience. Mine took place many years ago at the Air Mobility Command Museum at Dover Air Force Base in Delaware, when I stood in front of a Douglas C-47, the military version of the DC-3. A curator told me its story: It had dropped paratroopers

BY LINDA SHINER

into France on the first night of the 1944 Normandy invasion and resupplied them in the days following. It was one of the first airplanes enlisted to deliver food to Berliners when the Soviets blockaded their city in 1949. It flew for a few years Stateside doing this and that. In its last job, it suffered the abuse of student pilots in CH-54 helicopters: More than a few dropped it trying to learn to lift it. Though it had survived D-Day and the Berlin Airlift, it was in a sorry state, the museum curator told me, when his restoration team got it. But there it was, chin lifted in that stance DC-3s are famous for, restored and exquisite in its olive drab paint and black-and-white invasion stripes. And even though I told myself that what I was looking at was merely a collection of aluminum sheets riveted together (into an admittedly very pleasing shape), I felt elated that it had “survived.” What’s more, I thought it looked “valiant,”

and a man standing next to me thought so too. He added “proud.”

We’re nuts, of course, but so what? Why not lay on these objects the human emotions of struggles and triumphs? They help us understand history, and, maybe more important, feel it.

Nothing celebrates the emotional power of airplanes more enthusiastically than the People’s Choice competition of the National Aviation Heritage Invitational, created by Rolls-Royce Vice President Ken Perich. For 10 years, Rolls-Royce North America Inc., the Smithsonian Institution’s National Air and Space Museum, the National Aviation Hall of Fame, and the Reno Air Racing Foundation have sponsored a competition for aircraft owners who restore vintage airplanes to encourage the preservation of aviation history. Trophies are given in several categories for the most historically accurate restoration. But one trophy—the People’s Choice—rewards charisma. What earns the votes is almost always the airplane’s story.

This summer at the Experimental Aircraft Association’s Oshkosh, Wisconsin fly-in, six past champions are vying for the hearts and votes of aviation fans in what the Rolls-Royce team calls the “National Aviation Hall of Fame Best of the Best.”

These are their stories.



**1939 Spartan
Executive**



**1930
Kreider-Reisner
KR-21A**



**Grumman
J2F-4 Duck**



© PHILIP MAKANNA/GHOSTS

AND THE WINNER IS...

WHICH ONE OF SIX PAST CHAMPIONS WILL GET YOUR VOTE?



MIKE ULLERY

The resurrected P-38 *Glacier Girl* (top) won a 2003 People's Choice award in Dayton, Ohio (above). The late Roy Shoffner (in cap) extracted the airplane from Greenland ice and put Bob Cardin (at left) in charge of a 10-year rebuild. Trophy presenter Neil Armstrong applauds at right.

CELEBRITY Lockheed P-38 Lightning

If trophies were awarded for fame, the winner would surely be *Glacier Girl*, a Lockheed P-38 that has been drawing crowds at airshows for the past five years. Just about everyone knows the story of the airplane's 1942 emergency landing in Greenland, its burial under 260 feet of ice, its miraculous 1992 rescue, and its award-winning restoration (see "Glacier Girl," Feb./Mar. 2004), crowned by the completion of its mission: a flight to England begun 65 years earlier.

Glacier Girl is a P-38F, the third revision of the fighter that Kelly Johnson and his team

continued to improve throughout the war. Despite being heavier than earlier models, it was also a little faster, able to reach 395 mph. (Later models of the Lightning pushed past 400 mph in level flight, the first U.S. fighters able to do so.) Though no Luftwaffe pilot was ever happy to see a P-38, the fighter's reputation was made in the Pacific, where pilots like highest-scoring U.S. ace Richard Bong bested Japanese Zeros.

The Lightning is sometimes overshadowed by the Mustang to which it handed off the job of escorting bombers to Germany. But though the North American P-51 is considered by many the more capable

fighter, the odd-looking P-38 somehow has more panache.

When owner Rod Lewis, president of the Lewis Energy Group in San Antonio, Texas, bought the famous fighter last year, he was committed to the costly transatlantic flight. "Mainly I'm interested in preserving the heritage and history," he says. (Lewis owns seven other warbirds, including *Rare Bear*, a Grumman F8F Bearcat racer and record holder.)

And *Glacier Girl's* future? "We plan on attending a few airshows a year," says Lewis, "and people can see her in San Antonio. We're not going to cover her up." Good news for an airplane that spent 50 years under ice.



1927
Waco 10T



1943 Piper L-4
Grasshopper



Lockheed P-38
Lightning

JOHN DIBBS

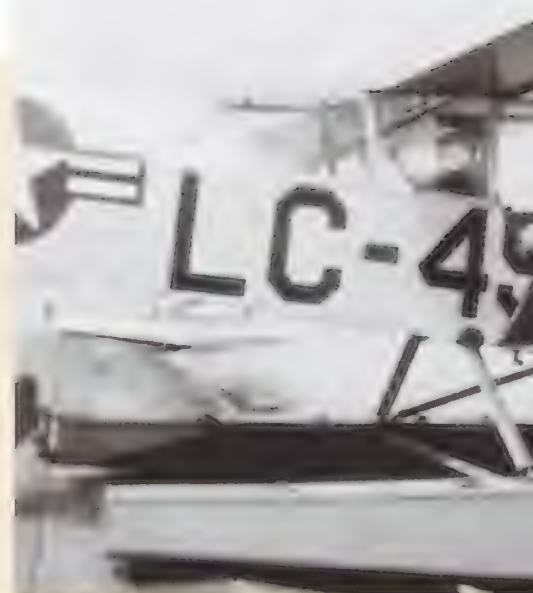
HISTORY Grumman J2F-4 Duck

Every airplane competing for the National Aviation Hall of Fame People's Choice award has a claim to history, but the only one to have had a ringside seat at an event that changed the world is Chuck Greenhill's Duck. On December 7, 1941, the Grumman J2F-4 was serving



WICHITA AIR SERVICES/CHUCK GREENHILL ARCHIVES

The Duck dove into a Bahamas lake in 1955; it was pulled out 36 years later (left). Chuck Greenhill had it brought up to speed by a Kansas restoration outfit and pitched in with parts he machined himself. Below, Greenhill gooses the flying boat along Wisconsin's Fox Lake and is dwarfed by a Mighty Duck pontoon (bottom).



XAVIER MEAL (2)

with U.S. Navy utility squadron VJ-1, stationed at Pearl Harbor, when the Japanese bombed Ford Island. Undamaged by the attack, the Duck and other squadron aircraft took off that day to search for the Japanese fleet. The morning after, the J2F-4 returned to doing what it had always done for the Navy: a little bit of everything. Ducks transported officers, searched for and rescued downed airmen, flew photo missions, even dropped bombs now and then, but they won little glory for their trouble. (When you hear "Grumman" and "World War II," your next thought is Hellcat, Bearcat, or Wildcat – not Duck.) Greenhill, the president of Smalley Steel Ring Company in Lake Zurich, Illinois, owns three other Grummans, two Goose and an Albatross, and

has owned a Widgeon. "I just love old seaplanes," he says. "It's the freedom of just going anywhere, of being away from

the airport environment. Sometimes," he continues, "I go down to the hangar and walk around. I just love looking at them."



COURAGE 1943 Piper L-4 Grasshopper

In 2005, the National Aviation Heritage judges gave June and Colin Powers top honors, a reward for three years of painstaking work on their little liaison craft, the military version of a Piper Cub. The restoration was accurate right down to the alpha-numeric codes that manufacturers stenciled on airplanes bound for World War II service. (The codes identified the manufacturer and other details to expedite repairs.) "My goal was to make it as best I could a museum-quality restoration," says Colin Powers. In fact, sometime after the Oshkosh fly-in, the airplane is indeed headed for a museum: the Evergreen Air Museum in McMinnville, Oregon, where Powers is now the director of restoration.

Although Powers was gratified by the judges' recognition, what sticks in his memory from that weekend at the Dayton air show was another moment: meeting Carol Apacki, the daughter of an L-4 pilot, and putting her in the cockpit.

"The thing that most impressed me is the courage of the pilots who flew [liaison craft] in World War II," says Powers. During the war, pilot-observer pairs in L-4s and Stinson L-5s would scout frontlines in order to direct Army artillery fire and report enemy movements. "No armor, no arms," says Powers. (Spotter aircraft were frequently shot up by Ger-



COURTESY JUNE AND COLIN POWERS



RON KAPLAN

Waco 10T owner Alan Hoeweler (in light cap) hosts pilot and actor Dennis Quaid, whose grin says it all. Wacos are known for their sturdiness and for the confusing alpha-numeric soup of model designations. If biplanes sported bumper stickers, one on Hoeweler's 10T would read "My Other Waco is a UPF-7."



JUNE POWERS

World War II L-4s served in footwear ranging from skis to floats (top). Above, the Powers' trophy Grasshopper.

man fighters and ground fire, and if you've ever flown in the 75-mph Cub, you can imagine being out there in the breeze with a couple of Messerschmitts bearing down on you.) Powers was especially respectful of one pilot, Major Charles Carpenter, who bucked regulations to equip his L-4H with bazookas and took out half a dozen German tanks. "Bazooka Charlie" won an air medal, became famous, got promoted to lieutenant colonel, survived the war, and returned to teaching in Urbana, Illinois. He died in 1966.

His daughter, Carol Carpenter Apacki, had seen photos of the airplane her dad had loaded for bear, but had never seen the real thing – until she sat in the cockpit of June and Colin Powers' L-4. "It just seemed like a toy. I thought, *How could somebody be flying this in a war?* Before I never really got what all the fuss was about, how vulnerable he was."



DAN PATTERSON

FUN 1927 Waco 10T

My favorite story about the Weaver Aircraft Company, which gave the name "Waco" to its 1920s biplanes, takes place in 1927, after the company had become the Advance Aircraft Company and moved to Troy, Ohio. The Air Commerce Department had issued the first structural standards that aircraft were required to meet in order to gain an Airplane Type Certificate. By that time, the Waco 9 had won several cross-country races, carried hundreds of passengers, and made some money for its designers, Clayton Bruckner and Elwood

Junkin. But Bruckner and Junkin weren't trained as engineers, and when the government required that an aircraft withstand stress equal to 6.5 times its own weight, they got worried. What if their airplane could not? As it turns out, the Waco 9 tested by the U.S. Army in 1927 stood up to loads 7.5 times its weight, and subsequently the good old common sense of Bruckner and Junkin brought forth such hearty designs as the Waco UPF-7, which the Army bought as a basic trainer, and the estimable Waco 10T.

"It's very responsive, very quick on the controls because

of the taper[ed] wing," says owner Alan Hoeweler, who runs a business with his father and brother in their hometown, Cincinnati, Ohio. Hoeweler likes Wacos because he likes history, especially local history, and the fact that his Wacos (he also owns a UPF-7) are homegrown, so to speak, suits him. They represent a transition in American aviation, he says, between the delicate, wire-braced oddities of the Wright brothers and the mass produced monoplanes of the 1940s. And Hoeweler is just the customer that Wacos were designed for: He flies not for a profession but for fun.

ELEGANCE 1939 Spartan Executive

Kent and Sandy Blankenburg admit right away that they bought their airplane because of its looks. "It has the best Art Deco lines of any airplane flying," Kent says. The Spartan Executive is a luxury model, a 200-mph sedan manufactured in 1939 by a company begun

by an oil tycoon with a product targeted at a niche market: other oil tycoons. Blankenburg's Spartan spent part of its career in the corporate fleet of the Texas Fuel Company, known today as Texaco.

The Spartan Aircraft Company, founded in Tulsa, Oklahoma, amid the wealth from oil reserves that created Gulf,

Standard, and Sinclair oil companies among others, was acquired in 1935 by oilman J. Paul Getty. Six years later, when the United States entered the war, Getty tried to enlist in the Navy but was asked to instead manage production at his new airplane factory, which he steered toward the manufacture of parts for the warplanes

built by other companies.

The Blankenburgs' aircraft did its part in the war effort on the homefront: It flew for the Royal Air Force, which had a number of training bases in the United States. And it participated in an advertising campaign to urge private pilots to loan their airplanes for government use. In one print ad,



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Let's find out if *Air & Space* Web site visitors agree with the aviation fans at the EAA's 2007 AirVenture. Visit the site to vote for your favorite airplane and to find out which wins the Best of the Best People's Choice Trophy.



PHOTOGRAPHER UNKNOWN

actress Betty Grable stands on the wing of the Blankenburgs' Spartan, urging aircraft owners to help Uncle Sam. The Spartan and the glamour girl seem made for each other.

Evocative of the 1930s embrace of the Modern, the Spartan Executive has inspired the Blankenburgs to surround it with fashions of the time. In their hangar home at Pine Mountain Lake Airport in California, 180 mannequins dressed in period clothing surround the airplane. "We get accused of being a museum, and we take that as a compliment," Kent Blankenburg says. Although the airplane had no need for a major restoration when the Blankenburgs acquired it – for more than half of its life, the Executive, like many luxury automobiles, had had one owner who treated it well – the Blankenburgs had the interior reupholstered in leather and the fuselage stripes repainted in a tasteful Texaco green. The airplane, says Kent Blankenburg, flies like a champion and is an exemplar of the exquisite workmanship and sophisticated design that the American heartland was capable of in the 1930s.

Explaining why Betty Grable was a favorite pin-up girl among GIs during World War II, biographer Doug Warren once made a statement that could also describe the 1939 Spartan Executive: "It was more than the sexy picture that enamored them of her," Warren wrote. "There was a magical wholesomeness and substance they saw beyond the curves of her figure."

The Spartan sparkles in the rarefied air over Yosemite Valley, California; Betty Grable once tread lightly on its wing while urging pilots to loan their aircraft to Uncle Sam.

SPORT 1930 Kreider-Reisner KR-21A

Becoming the owner of an extraordinary airplane from aviation's Golden Age is sometimes a matter of extraordinary luck. For his rare biplane, Pat McNerney owes his luck to Jack Tiffany's son Nicholas. "Nick is ate up with antique aviation,"



COURTESY JACK TIFFANY



GREG MORELAND

says Tiffany. "He finds most of our airplanes for us" – "us" being Leading Edge Aircraft in Spring Valley, Ohio: four airplane lovers who restore and eventually sell vintage aircraft. "We're not a business," says Tiffany. "We're more of a cult."

At the 1995 Oshkosh fly-in, when Nick was 16, he spotted flyers advertising an airplane his dad had long wished for: a 1930 Fairchild KR-21. Of 49 built, only 14 are still registered with the Federal Aviation Administration. The biplane started out as a sportier offering in the line of trainers built by the Kreider-Reisner Aircraft Company of Hagerstown, Maryland, which became part of Fairchild in 1929.

Fairchild promotional materials of the time call the airplane "alert and sparkling" and say the Kreider-Reisner designers "were well 'fed up' with trying to wish a sluggish airplane over a line of trees." With a loaded weight of only 1,500 pounds and a 125-horsepower Kinner engine, the pretty little airplane can jump into the air and climb at 800 feet per minute.

Nicholas Tiffany wanted his dad to have a shot at the KR-21, so he removed all the flyers that owner Mike Butler had posted except one, which he presented to his father. Jack Tiffany bought the airplane and spent three years restoring it with his partners. The

Harry Brown, who owned NC207V in the 1930s, poses uncomfortably close to the spinning guillotine that is the propeller (top). Pat McNerney flies the Kreider-Reisner as its 28th owner (above).

wings were the biggest challenge: They are tapered and no two ribs are alike. "Rib number 3 on the left side wouldn't fit on the right," he says.

McNerney had also looked at a Waco biplane, but the KR, he says, "is a little more delicate than the Waco, and the cockpit is huge. Compared to a Great Lakes [biplane trainer], it's like sitting in a hot tub." ➔

DANGER: AIRPLANE CROSSING

CONTROLLING AIRPLANES ON THE GROUND IS A THORNIER PROBLEM THAN CONTROLLING THEM IN THE AIR.

RUNWAY 35 LEFT AT DENVER INTERNATIONAL AIRPORT looked clear to the pilots of a Frontier Airlines Airbus A319 as they dropped from a 600-foot ceiling of clouds one morning in early January 2007. Blowing snow cut visibility to about a half-mile, so they were flying an instrument approach.

Then they saw the airplane sitting on the runway, dead ahead. The pilot of the Key Lime Air cargo turboprop had inadvertently followed blue taxiway lights (the centerline lights were obscured by the snow), turning onto a 12,000-foot active runway at the nation's sixth busiest airport. A puzzled ground controller asked him where he was, just as the Frontier pilots spotted his airplane and yanked the nose of the Airbus up to abort the landing.

A collision alarm sounded in the tower. The two airplanes missed each other by about 50 feet.

Nearly once a day, on average, an airplane or airport vehicle ends up on a U.S. airport runway where it is not supposed to be. Such potentially hazardous incidents are called "runway incursions." Not all are as dangerous as the close call in Denver—one of at least five instances there since 2000. But according to the Federal Aviation Administration, almost every 10 days an incursion poses the serious chance of a collision. Only last-second reactions by pilots have averted several disasters.

The good news is that there are ways to prevent incursions. More than a decade of research by NASA, the Department of Transportation, and aviation companies shows that cockpit displays, like the moving maps now widely available in automobiles, plus bolder runway striping and lighting at airports, can prevent the most common pilot errors that cause incursions. Basic improvements are now becoming available. But growth in air traffic is making incursion rates rise (incursions more than doubled nationally as air traffic grew between 1994 and 2000), so safety leaders want to pick up the pace.

"We've got the technologies; it's now a question of deciding which of those technologies to use," says Mark Rosenker, chairman of the National Transportation Safety Board, which began pressing the FAA in the 1970s to step up prevention of runway incursions. "Too many incursions are occurring annually," Rosenker says. "We've been running on luck, and luck is no way to run a national air system."

The reality is that, until recently, runway incursions were eclipsed by more seri-



Who's at fault when airplanes cross paths where they're not supposed to?

Controllers, pilots, and even the Federal Aviation Administration share the blame.

BY MICHAEL MILSTEIN ILLUSTRATION BY PAUL DIMARE



ous dangers, such as airplanes colliding in the air or flying off course and into the ground (known as “controlled flight into terrain”), says Basil Barimo, vice president of operations and safety for the Air Transport Association, which represents the airline industry. Now that cockpit warning systems have greatly reduced those risks, runway incursions have risen to the top of the safety to-do list.

“You get the biggest risk first and then you work your way down,” Barimo says. “While runway safety is getting a lot of attention now, it’s only because we’ve eliminated, quite frankly, the more significant risks.”

There is no simple solution for runway incursions because there is no single cause. According to federal statistics, more than half happen when pilots make

a wrong turn or fail to stop short of a runway; responsibility for the rest is split between air traffic control mistakes and airport workers going astray when towing airplanes or driving trucks.

“It’s sort of hard to crack the code of why this happens,” says former FAA Administrator Jane Garvey, who made runway safety a priority during her term, from 1998 to 2002. “You find an awful lot of human error. Those are always more difficult because they are unique to the individual.”



ilots sometimes refer to travel between the runway and an airplane’s parking spot as “the forgotten phase of flight”—and many

consider it the most demanding. Sweeping tarmac disappears into the horizon, especially at night, when airfields become a sea of blue taxiway lights. Sophisticated instruments that help pilots navigate in the air offer scant help on the ground, leaving air crews to find their way with little more than paper maps. Pilots must combine what they see out the window with their map of the airport to figure out where they are, at the same time they’re communicating with their airline and ground control and maneuvering the airplane. “There are points when [successful communication] doesn’t happen, and that’s how we end up with incursions,” says Rick Shay, a United Airlines pilot. Experts call the lapses “loss of situational awareness.”

While high-end automobiles now car-

ry color electronic maps that display the car's location on roads and highways, "we don't have that in our cockpits," says Terry McVenes, a US Airways captain who leads safety efforts for the Air Line Pilots Association.

David Foyle, who studies incursions at NASA's Ames Research Center in California, recalls sitting with two pilots in the cockpit of a NASA Boeing 757 at a three-way intersection at Atlanta's Hartsfield-Jackson International Airport a few years ago. The pilots couldn't agree on which way to go. "They stopped the airplane and they started arguing about it," Foyle says. The airplane was already past signs for the intersection, and the pilots had no way to tell on their own where they were. It turned out neither pilot was right.

It doesn't help that many busy airports were not designed for today's booming air traffic, says Paul Erway, the FAA's acting director of runway safety. As incursions multiplied, the FAA increased training for controllers and launched campaigns to educate pilots. That has helped, says Erway. What's left are a stubborn few errors that may never be eliminated as long as people are involved.

"Because we're human, we're going to

make mistakes," he says. "What we're looking at now is modifying the system so the inevitable human error doesn't result in catastrophe."



Los Angeles International Airport has recorded more than 40 runway incursions since 2001. The cramped airport layout, dating to the 1950s, forces airplanes to cross two inner runways and two parallel outer runways to go between terminals. Aircraft cut across the inner runways roughly 900 times a day. Twice last year, controllers told pilots to stop before crossing and heard the pilots repeat the instructions back, only to see the pilots go across the runway anyway—into the paths of airplanes that were taking off. Almost every day, says Michael Foote, an air traffic controller at LAX, at least one pilot does not follow his instructions.

In one incident, the pilot of a departing commuter jet can be heard on air traffic control tapes gasping for breath after a British Gulfstream jet crossed in front of him, forcing him to jam on the brakes, even though controllers twice told the Gulfstream not to proceed. The commuter's

brakes took 40 minutes to cool down.

The risk of collisions rises roughly twice as fast as the growth in air traffic, according to Arnold Barnett, a professor at the Massachusetts Institute of Technology's Sloan School of Management. That's because as more airplanes travel through airports, risk rises in two ways. First, more aircraft are likely to stray into the wrong place. Second, more airplanes make it more likely a straying aircraft will collide with another one. The top 32 busiest U.S. airports already log about twice as many close calls as others.

Based on FAA projections of increases in air traffic, Barnett calculates that, if nothing is done, by the early 2020s, U.S. airports could experience about 15 fatal accidents, killing as many as 700 to 800 people. The low number of major accidents so far indicates that for airplanes to hit each other, errors must happen at precisely the wrong time—and that's rare. "Not only do people have to make mistakes, but you also have to have really bad luck for a collision to occur," Barnett says.

Catastrophes have already struck. On a foggy runway on Tenerife, one of the Canary Islands, in 1977, the pilot of a KLM Boeing 747 apparently misunderstood air traffic control instructions and acceler-

GETTING OUT OF THE WAY

THE FAA AND PRIVATE COMPANIES HAVE DEVELOPED SEVERAL APPROACHES TO PREVENT RUNWAY INCURSIONS.

Occupied Runway Signal

Airplanes or vehicles on the runway trip sensors, which causes approach path lights to flash. The flashing lights signal pilots of incoming aircraft that the runway is occupied and that they should abort landing. System prevents airplanes from landing when another is waiting to take off, a situation that has caused past close calls and collisions.

Status: Testing is under way at Long Beach Airport.

More info: www.faa.gov/safety/programs_initiatives/aircraft_aviation/run_safe/faros

Runway Painting

Additional taxiway striping highlights taxiway turns and emphasizes approaches to hold lines, where airplanes must stop and wait for clearance from controllers before entering a runway. Red and white runway labels on pavement at each intersection reinforce lighted signs on the shoulders, reminding pilots where they are.

Status: Required at major U.S. airports by 2008.

Runway Status Lights

Red lights automatically switch on at entrances to a runway when an airplane is taking off or on final

approach, signaling other airplanes not to enter. The lights, activated by existing radar systems, turn off as planes travel down the runway past each intersection, indicating other planes can safely cross when controllers give the go-ahead.

Status: Undergoing trials in Dallas and San Diego.

More info: www.rwsl.net

Runway Awareness and Advisory System

Voice alerts notify pilots via their headsets when they approach runways and when they line up with runway for takeoff or landing. States runway number, so pilots

can make sure they are on the correct runway and do not cross the wrong one. Also tells pilots the length of runway available for takeoff or landing.

Status: Available from Honeywell Aerospace. Installed on aircraft in six airlines.

More info: www.egpws.com (click on RAAS)

SafeRoute Surface Area Movement Management

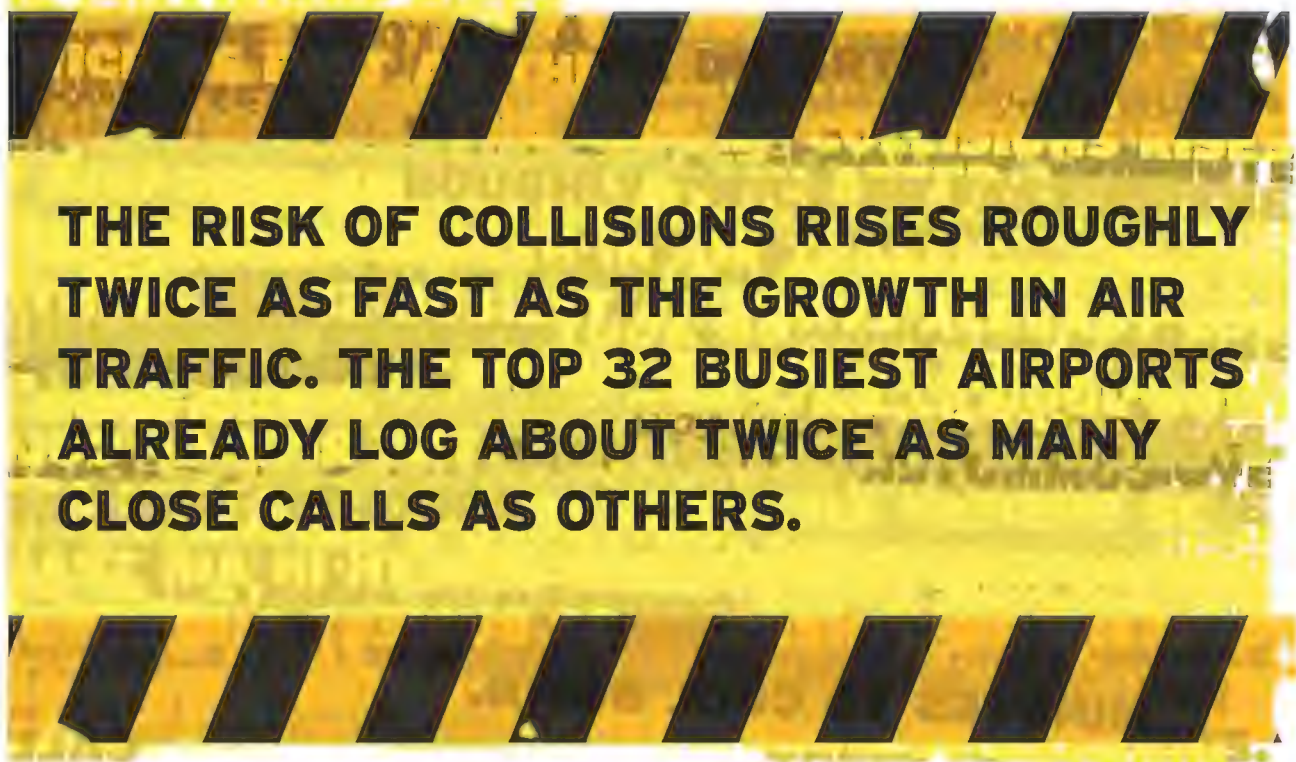
Electronic map in cockpit shows location of airplane and other aircraft amid taxiways, runways, and terminals. Warns pilots when airplane approaches active

ated into a Pan Am 747 taxiing along the airport's single runway. Everyone on the KLM jumbo and most on the Pan Am airplane died—583 in all.

One of the deadliest runway incursions in the United States occurred at LAX in 1991. A harried controller burdened with a broken ground radar, trying to do multiple jobs and distracted by a search for paperwork, cleared a USAir Boeing 737 to land on the runway where a Skywest Metro commuter flight awaited takeoff. Twenty-two people were killed. NTSB investigators blamed the FAA for designing an air traffic control system that depended unrealistically on "flawless human performance" at busy airports and said that system designers shared responsibility for the disaster.

Ever since, the NTSB has urged the FAA to develop an automated system to detect potential incursions that controllers and pilots missed. The FAA tried. But its Airport Movement Area Safety System, or AMASS, turned into a case study of why runway incursions are so hard to avoid.

While computers can spot airplanes flying on a collision course, they have a harder time predicting that a pilot is about to make a sudden wrong turn onto a run-



way—or fail to stop in the right place. By 1999, with the warning system more than doubling in cost from the original \$60 million price tag, the FAA said it could not keep aircraft from straying onto runways but would try instead to identify those airplanes likely to collide.

When an Air China 747 taxied onto a runway where a Korean Air 747 was taking off at Chicago's O'Hare International in 1999, AMASS sounded an alarm in the tower only six seconds before the air-

planes would have collided. Controllers had too little time to identify the airplanes involved, contact the pilots, and tell them what to do. The Korean Air pilot spotted the other 747 on his own and pulled up, banking sharply. He lifted off, avoiding catastrophe by a mere three seconds and 75 feet.

Controllers need AMASS most in bad weather, but the system mistakes rain showers for airplanes. At John F. Kennedy International Airport in New York City,

runways. Part of a broader onboard display system developed by Aviation Communication & Surveillance Systems of Phoenix that also helps sequence landing aircraft.

Status: Undergoing trials on United Parcel Service airplanes.

More info: www.acssonboard.com/products/saferoute

New Taxiways

Airplanes follow new taxiways that loop around the ends of active runways toward terminals, keeping them from having to cross runways. The taxi may take longer, but the new taxiway reduces risk of runway incursions and eliminates time

spent waiting for a safe opening to cross runway.

Status: Under construction in Dallas and Atlanta. New taxiway between runways in Los Angeles gives airplanes a place to stop before crossing.

Airport Surface Detection System, Model X

Provides controllers a more complete map of traffic within airport, using signals from each airplane's transponder to label the airplane on the map. Eliminates blind spots and reduces confusion over which airplane is which. Also operates in bad weather, which has often forced shutdown of earlier systems.

Status: Operating at about

10 airports; FAA plans to install at 35 airports by 2011.

More info: www.sensis.com/docs/128

Surface Guidance System

Draws the correct taxi path on a glass screen pilot looks through while steering the airplane. Also highlights edge of taxiways by showing traffic cones and displays traffic cones where pilots are required to stop before crossing runway. Shows pilot the distance to upcoming turns and, in the future, may display other aircraft.

Status: Developer Rockwell Collins seeking trial customer.

More info: www.rockwell-collins.com/products/cs/br/

HGS/sgs/index.html

Runway Incursion Prevention System

Refitted airport lights shine ultraviolet beam across runway intersections, creating an invisible trip wire that detects aircraft entering the runway and signals pilots through red lights or other means. Operates in all weather and is relatively inexpensive because it does not need to be connected to radar systems to detect aircraft.

Status: Detected incursions during testing in Providence, Rhode Island. Developer Norris Electro Optical Systems Corp. seeking initial customers.

More info: www.norriseo.com

controllers disabled the system one night in July 2005 because of downpours. An Israel Air 767 missed a turn and taxied in front of a departing DC-8 freighter. The freighter pilot later guessed his airplane's tail came within 45 feet of the 767.

Investigators concluded the system works backward. Making pilots depend on controllers for warnings is like driving a car while waiting for a cell phone call that tells you to watch out for a truck you cannot see, the Department of Transportation's inspector general, Kenneth Mead, told Congress five years ago. "The very slow pace of fielding technology, the failure to move forward expeditiously with promising new technology, is a major part of the problem and, hence, must be focused on as a major part of the solution," Mead said.

The FAA also backed research by NASA into a concept that is called "synthetic vision": a virtual view out the cockpit window that shows pilots everything they wish they could see, but

the locations of other airplanes appear.

NASA demonstrated synthetic vision aboard a Boeing 757, along with a separate cockpit screen that showed the airplane's location against a moving map of the airport. Electronic links with the control tower relayed the airplane's taxi route and the location of other airplanes, so they showed up on the map too. Test flights at Dallas/Fort Worth International Airport in 2000, using a van to simulate another airplane intruding on the runway, found the onboard system alerted pilots to problems 10 to 20 seconds before controllers were aware.

In NASA simulations, the same airline pilots who made wrong turns and other mistakes taxiing through the Chicago airport in low visibility made no errors when they had the displays in their cockpit.

Current head-up display systems, however, do not carry enough airport details to guide pilots beyond the runway. Rockwell Collins began searching about five years ago for airline backing to develop its Surface Guidance System at a likely cost of several million dollars—the final cost will depend on what sort of aircraft the system is being developed for and what other avionics are already on board.

The goal was to translate NASA's demonstrations into commercial reality. The vision was grand: Pilots would see taxi routes projected onto the screen in front of them, advising them how to adjust their speed to make the next turn. Traffic cones would pop up across their paths when they approached a runway they should not cross. But then came September 11, 2001, and suddenly airlines were more focused on survival than investment.

"Everybody thought it was a great idea, but there was no money to develop it," says Peter Howells, the main system engineer at Rockwell Collins. The other problem, he adds, is that while everyone is concerned about incursions, many airlines see it as a problem caused by the mistakes of other pilots. "They say, 'It's not us that has the problem. It's those other people. Why should we invest in this equipment when it's the others causing the issue and we're essentially the victims?'"

NASA's Foyle and Becky Hooey, a San Jose State University researcher based at the Ames center, found a good reason for such investment when they studied the performance of pilots in NASA simula-

tors. Advanced displays reduced pilots' workload; a moving map helped plot their route, and a head-up display helped them plan upcoming turns. They taxied faster and reached the gate sooner. Rockwell calculates the extra speed would enable a 737 carrying about 150 people to earn another \$35,000 to \$50,000 a year. That payback will probably drive what airlines will spend on the system, Howells says. But FAA leaders and others caution that an elaborate new system does little good if airlines cannot afford to install it in their airplanes. While new-generation aircraft will likely carry head-up displays as standard equipment, it's difficult for airlines to make a good business case for installing the displays purely in the interest of runway safety, says Barimo of the Air Transport Association.


As a backbone of its strategy to handle traffic in ever-busier skies, the FAA is now investing heavily in ADS-B, a system that provides more precise air traffic data (see "How Things Work: Aircraft Identification," Oct./Nov. 2006). The system will help prevent runway incursions too, making it easier for controllers and pilots to see the location of aircraft on runway maps. But it will cost close to \$7 billion—with the price split among the FAA, airlines, and others—and will not be completely finished until 2035.

"This is a very important area to us," FAA spokesperson Laura Brown says. "But we have a lot of other technologies we're working on, and they always compete for funding."

There is also a resistance to filling cockpits with gadgets, both because of cost and because no one wants to distract pilots, says Robert Francis, a longtime FAA official who later served on the NTSB. And any new equipment for airplanes must be foolproof before it can be put in place.

"The real challenge is: How do you balance the need to be responsive with the need to be so careful and so precise?" says former FAA administrator Garvey. "The degree of precision in navigating a car is very different than what you have to have in aviation."

Controllers are getting an important new tool as well: a new ground radar system known as Airport Surface Detection Equipment, Model X. It provides an all-weather view of the airport by combining radar signals with data from airplane



**"WE'VE BEEN
RUNNING ON
LUCK, AND LUCK
IS NO WAY TO
RUN A NATIONAL
AIR SYSTEM."**

**—MARK ROSENKER, CHAIRMAN,
NATIONAL TRANSPORTATION
SAFETY BOARD**

can't. It's computer-generated and projected onto a glass screen in front of the windshield. The screen is called a "head-up display" because pilots look straight ahead to view it. Even when thick fog or darkness obscures the view outside, the bright outlines of runways and—with the most advanced technology—

**IN ONE INCIDENT, THE PILOT OF A DEPARTING COMMUTER JET CAN BE HEARD ON AIR TRAFFIC CONTROL TAPES GASP-
ING FOR BREATH AFTER A BRITISH GULFSTREAM JET
CROSSED IN FRONT OF HIM. THE COMMUTER'S BRAKES
TOOK 40 MINUTES TO COOL DOWN.**

transponders. An electronic airport map labels each aircraft on the screen so controllers know which is which. But it, too, is behind schedule, because of funding problems, and will not be in place at 35 leading airports until 2011.

One bright winter day, Markus Johnson, chief test pilot for Honeywell Aerospace, lines up his Beechcraft King Air for takeoff from Salem, Oregon. The sun glares in his eyes, but he's on the right heading to depart from Runway 16. He guns the engines and the airplane rolls faster. Suddenly, on his headset, he hears an urgent voice: "On taxiway! On taxiway!"

His airplane carries Honeywell's Runway Awareness and Advisory System, an inexpensive (less than \$20,000) software upgrade to a common system that warns pilots when they approach dangerous terrain. It contains electronic airport maps and closely monitors the airplane's direction and speed. Six airlines have already installed it.

"There are a million different reasons why pilots lose track of their position," Johnson says. "What we want is RAAS to be this third guy in the cockpit who's just watching and is going to tap you on the shoulder and say, 'Here's where you are.' If you agree with that, that's great. If you don't agree with that, you say, 'Let's stop and see what's wrong.'"

For pilots of a Comair commuter jet that took off from the wrong runway

in Lexington, Kentucky, last August, the runway awareness system would have given three key warnings they were off course: when they approached, when they lined up, and again when the system recognized the runway was too short for their jet to take off from. As it was, the pilots didn't realize that until they were beyond the point where they could abort their takeoff; 49 of 50 people aboard were killed.

At San Diego's Lindbergh Field, the busiest single-runway commercial airport in the nation, the runway is sacrosanct. "Our dependency on the use of that runway is absolute," says Ted Sexton, vice president at the airport and a former Navy pilot. Airplanes scream in and out less than two minutes apart on average, so if anyone happens to stray onto the runway, "someone gets hit in two minutes."

Now San Diego has a new tool to keep pilots on track: prototype FAA warning lights that signal pilots to stay off the runway when it's occupied. Consider it a \$6 million stoplight. They're called runway status lights, and they're embedded in the pavement at key runway intersections. When airport radar detects an incoming airplane within a mile of the airport or a departing airplane accelerating above 34 mph, the red lights switch on. It's a clear no-go signal to waiting pilots.

There's a delicate balance at an airport this busy: It can't afford lights that slow traffic like an ill-timed stoplight on a busy highway. These lights switch

off just before it's safe to cross, because waiting airplanes will take a few seconds to spool up their engines before they actually begin moving onto the runway. By that time, the runway will be clear.

Similar "stop bars" of red lights built into the intersections at major European airports, such as London's Heathrow, make incursions a non-issue there, the NTSB says. U.S. Department of Transportation studies of past runway incursions suggest that runway lights would have alerted one or both of the pilots in about 65 percent of cases. The lights, combined with the slow but still helpful AMASS system, would catch about 85 percent of all incursions, the studies found. A similar prototype in Dallas won raves from pilots. A single Dallas runway may handle 450 flights per day, with 500 runway crossings mixed in. More than 90 percent of pilots surveyed said the lights would reduce incursions. The FAA now considers the lights very promising, and will decide later this year whether to expand the program to other airports.

Last March, FAA Administrator Marion Blakey eliminated an FAA requirement that electronic cockpit maps work in the air as well as on the ground. They can now be developed for ground-only use. That will "change how pilots safely navigate runways, the way GPS changed the way we drive our cars," she said. "I'll say it plainly: It needs to be in the cockpit. It's ready, we're ready, and aviation needs it." —

WE SHOCKED THE WORLD

NIKITA KHRUSHCHEV'S SON RECALLS THE NIGHT SPUTNIK MADE HISTORY.

by **Sergei Khrushchev**

Translated by Lyudmila Khomenko Chillico



ON THE EVENING OF OCTOBER 4, 1957, my father was waiting for a phone call. Chief Designer Sergei Korolev was expected to call from the Tyuratam launch site (later renamed Baikonur Cosmodrome) in Kazakhstan to report the outcome of the launch of the world's first artificial satellite.

Earlier that day, my father had been in Kiev, Ukraine, on military business. He attended a demonstration of tanks crossing the Dnieper River, then he discussed with some Soviet generals the fate of Defense Minister Marshal Georgy Zhukov. (Zhukov was suspected of plotting to seize power, and before forcing a decorated World War II general to resign, political leaders enlisted the higher-ranking generals' support. The generals all agreed with the plan.)

That evening, in Mariyinsky Palace, now the official residence of Ukraine's president, my father sat at the dinner table talking with the Ukrainian leaders. I settled into a chair at the end of the table, not paying much attention to the conversation. It was late and everybody was tired, but my father wasn't in a hurry to say goodnight. Around midnight, the door cracked open and the secretary asked my father to take a phone call. When he came back in the room he was smiling, and I knew right away that the launch of Sputnik had been successful.

"A moment ago, an outstanding event happened," my father told the room in a voice that could not quite conceal his elation. "Korolev has called me and reported that two hours ago the artificial satellite was put into orbit."

The name Korolev didn't mean anything to the Ukrainian leaders. My father started talking about rockets, engineers, and our achievements. The Ukrainians were agreeing politely but were not really interested. They wanted to come back to the dis-

cussions that had been interrupted by the phone call, about the region's agriculture, finance, and other matters.

The secretary came into the room again, silently turned on a shortwave radio in the corner, and tuned it. Now, from the speakers, Sputnik's signals came through: *beep...beep...beep*. My father listened intently, then the signals grew gradually softer as Sputnik went over the horizon. The session was over, as well as the conversation. My father apologized, said it was late, and went to bed.

The next day, *Pravda* and other Soviet newspapers published on the front page a 50-line, two-column official announcement from the TASS news agency. It began: "The design and development of artificial Earth-orbiting satellites have been done for several years in the Soviet Union."

Engineers had begun designing Sputnik in January 1956. The plan was to launch it with the R-7, the intercontinental ballistic missile that Korolev's team had been working on since 1954. Like later Soviet missiles, the R-7 had military purposes as its primary application and space research as its secondary application. On February 26, 1956, my father and I (I was a student at the Moscow Electric Power Institute—in American terms, an engineering college) had visited Korolev's design office in Podlipki and viewed missiles, including a full-size model of the R-7. At the end of the visit, we listened to a brief talk on the possibility of the R-7 launching an artificial satellite. Having a fondness for technological innovations, my father got interested in that, but he warned Korolev, "The main priority is security of the country."

The author, whose father was first secretary of the Soviet Communist Party from 1953 to 1964, relaxes in his office at Brown University in Providence, Rhode Island.



TASS at the time had been reporting that satellite launches were scheduled in connection with the International Geophysical Year, a worldwide program of coordinated scientific observations of geophysical phenomena. Soviet newspapers had even published the frequencies of the satellites' radio transmitters. But all of the reports were vague, with no mention of launch dates. Nobody in the rest of the world would pay attention to such pronouncements; everybody outside the Soviet Union *knew* the United States would soon launch the world's first satellite.

Korolev was afraid that the Americans might be ahead. He was especially worried when he found out that the U.S. Army's July 1957 test of the Jupiter ballistic missile had been a success. After that, he thought that the Americans would open the door to space before his R-7 had even flown. Korolev was in a hurry. The meeting of the IGY committee was scheduled for the beginning of October, at which time the American scientists intended to tell their plans for space.

Korolev believed that the Americans would keep their plans a secret until after they had succeeded in launching a satellite, so he put all his efforts into beating the Americans to it. In August and September his missile was successfully launched twice. Korolev made everybody on his team work around the clock. He wanted to launch Sputnik before the opening of the IGY meeting. And he made the deadline.

Sputnik's launch made the front page of *Pravda*, but just barely. The story occupied the same amount of space as a report on Marshal Zhukov's visit to Yugoslavia and ran in a less prestigious position on the page. There were no big headlines, no enthusiastic

comments. In fact, except for the official TASS account, there was not a single line about an event that astounded the rest of the world. How could that possibly happen?

The explanation is quite simple. My father and I and all the Soviet people thought

that it was natural, that step by step we were getting ahead of the Americans. After all, we—not the Americans—put into operation the world's first nuclear power plant. It was the Soviet MiG, a prototype of a new fighter designed by A.I. Mikoyan, that set a number of world records in the 1950s. The Soviet Tu-104 was the most efficient airliner of its class. As a result, the achievement of orbiting the world's first satellite aroused pride and delight among Soviet citizens, but not astonishment. A lot of popular books had been published in the Soviet Union about future space stations and flights to the moon

and Mars. Space travel seemed quite feasible, and the readers of those books—including me—looked forward to it. We just couldn't understand why the engineers were taking so long.

On October 5, the world press couldn't write about anything but "the Soviet red moon." On that day in Moscow, everybody realized what had actually happened, what a scientific and propaganda achievement the launch was: the first-in-the-world ar-

Soviet leader Nikita Khrushchev (second from left), who headed the technological superpower at the time of Sputnik's launch, greets first man in space Yuri Gagarin, flanked by wife Valentina (with flowers) and mother Anna, at a 1961 Kremlin reception. At far right: Sergei Korolev and wife Nina.



tificial satellite. On October 6, *Pravda*, a day late, devoted its whole front page to space. At the top was a huge headline, “The world’s first artificial satellite was made in the Soviet Union!” It was followed by comments from all over the world, with a photograph of people listening to Sputnik’s beep over the radio. On page 2, the newspaper printed an article on space research and plans for the future.

A couple of days later came a declassified picture of the satellite, an 84-kilogram (184-pound) sphere with four whip-like antennas. Then newspapers reported how many thousands of kilometers the satellite had covered, its orbital parameters, where and at what time people could see it in the sky. On October 12, *Pravda* ran a photograph of the satellite’s track: a thin bright strip in the pitch-black night sky over Melbourne, Australia.

What the newspapers did not report was the name of the man who designed the rocket, the chief of the design office where Sputnik was created. At that time, nobody knew the name Sergei Korolev; it was classified. The KGB knew there was really no need to keep the designer’s name a secret, but as KGB chief Ivan Serov told me, the enemy’s resources were limited, so let them waste their efforts trying to uncover “non-secret” secrets, and as for real secrets, the enemy’s arms were too short to reach them.

The newspapers referred to the chief of the design office as

“Chief Designer,” and Korolev signed his articles in *Pravda* as “Engineer Sergeev.” But the world was desperate to learn his identity. The Nobel Prize committee decided to give an award to the “Chief Designer” without polling the world’s scientists, but first it needed the person’s name. The committee requested it from the Soviet government.

My father needed to think over his response. The matter was complicated, and his concern wasn’t confidentiality. The Council of Chief Designers was in charge of all space projects; the head of the council was Korolev, but the other Chief Designers—more than a dozen—considered themselves no less significant. After Sputnik, all of them had been equally awarded the Lenin Prize and other Soviet honors.

My father understood that the Chief Designers were ambitious and jealous people. If the Nobel committee were to give the award to just Korolev, my father thought, the members would fly into a rage. They would refuse to work with Korolev. A well-organized team would collapse like a house of cards, and the hopes for future space research and missile design would be dashed. That in turn would threaten the security of the country. As my father saw it, you could order scientists and engineers to work together, but you couldn’t force them to create something.

In the end, my father told the Nobel committee that all of the Soviet people had distinguished themselves in the work on Sputnik and that they all deserved the award. Sure enough, Korolev was offended, but he kept silent. The rest of the Chief Designers quietly approved of my father’s decision. The Nobel was awarded to somebody else.

But despite the pains my father had taken, the outcome he had feared came to be. The other designers expressed more and more discontent about Korolev getting all the publicity, even if anonymously. In their “secret” world, it wasn’t any secret who was behind the title “Chief Designer,” written with initial capital letters.

The first to revolt was Valentin Glushko, an engine designer who was more significant in scientific circles than Korolev. (Today, it’s Glushko’s RD-170 liquid-propellant engine that is flying on Russian and some American rockets.) During one council meeting, Glushko said, “My engines could send into space any piece of metal.” Korolev was offended; his rocket wasn’t just a piece of metal, and after his success with Sputnik, he no longer considered Glushko his equal. The dispute was hushed up, but the resentment lingered. Soon Glushko offered his services to other Soviet rocket designers, Mikhail Yangel and Vladimir Chelomei—Korolev’s rivals. Korolev, furious, called Glushko a snake in the grass and refused to cooperate with him again.

Even my father couldn’t make peace between them. Technically Glushko, by government order, continued to design engines for Korolev, but the work under pressure wasn’t good. Without Glushko’s best efforts, Korolev had a hard time; as a result, he—and the Soviets—lost the race for the moon to the Americans, despite the initial triumph of Sputnik. —

From the same pad at the Baikonur Cosmodrome where Sputnik was launched in 1957, Russia today sends Soyuz rockets into orbit.



SCOTT ANDREWS

RUSSIA'S LONG LOVE AFFAIR WITH SPACE

IT STARTED WITH UTOPIAN DREAMS AND ROCKETEERS.



Visions of spaceflight, like Friedrich Tsander's rocketplane (right), inspired 1920s Soviet film, fiction, and art. Above: Ilya Chasnik's painting "Cosmos."

ON A RICKETY COMMUTER TRAIN HEADING OUT OF WINTRY MOSCOW, Sergei Samburov was explaining why his country's fascination with space has been so deep and enduring. The great-grandson of Konstantin Tsiolkovsky, the "father" of Russian cosmonautics, Samburov (pronounced sam-BUR-off) is the president of the Tsiolkovsky Fund in Moscow, a group that educates young Russians about Tsiolkovsky's contributions by re-publishing his works, holding seminars, and sponsoring competitions in schools. He had invited me to the city of Kaluga, where Tsiolkovsky lived in the last years of his life, to show me some of the great man's papers and books. A short, gregarious man in his mid-50s, Samburov spoke with conviction about the future of Russian space travel. "Space is part of the Russian soul!" he exclaimed, as a snow-capped landscape passed by the train window. "This is why thousands of average Russians contributed money to save the Mir space station when it was ready to fall from orbit."

BY ASIF SIDDIQI

Each year during the annual Tsiolkovsky conference in Kaluga, a mid-size industrial city 100 miles south of Moscow, Russian space enthusiasts and historians analyze the interest in space that gripped the Soviet citizenry in the years after the 1917

RIGHT: MEAD ART MUSEUM, AMHERST; FAR RIGHT: ASIF SIDDIQI

revolution. Still years away from the horrors of the Stalinist era, the 1920s were a brief period of hope for many Soviets. For them, one bright future lay in the concept of space travel depicted in dozens of books and hundreds of articles in popular journals, in the paintings of major artists, in the fiction of famous writers, in exhibitions of rocket and spaceship models, and even in the burgeoning Soviet film industry. The fad had a distinctly ramshackle feel to it, with the zany and the serious competing for the same column space in newspapers. Some enthusiasts volunteered to fly rockets to the moon, while others put their faith in the possibility of space travel as a kind of salvation from problems on Earth. The first great generation of Soviet space designers, including Sergei Korolev and Valentin Glushko, came of age during the 1920s.

Space historians typically name three pioneers as the founding fathers of astronautics: Tsiolkovsky, the American Robert Goddard, and the German (although Romanian-born) Hermann Oberth.

A 3-D panorama of a fictional planet graced the entrance to a 1927 Moscow exhibit on space travel, the world's first.

All three achieved enormous fame in the Soviet Union. It was Oberth who was credited with launching the Soviet space fad in 1923, when news of his classic *By Rocket Into Planetary Space* reached Moscow. One newspaper editor, dazzled by Oberth's ideas, asked in a headline "Is Utopia Really Possible?" Tsiolkovsky, who was living in obscurity in Kaluga at the time, found the attention to Oberth insulting. His countrymen, he complained in writings that convey his annoyance, were eulogizing a foreigner (and a German to boot!) over his own contributions, which at the time were largely unknown. The following April, Tsiolkovsky re-published his much older works on space travel in

Kaluga's cosmonautics museum opened in 1967, six years after Yuri Gagarin, the first man in space, laid its cornerstone.

order to remind his fellow Soviets that his work had beat Oberth's by 20 years. The re-printing of Tsiolkovsky's papers in 1924 coincided with a number of space-related events, including the sensational news from the United States that Goddard was about to launch a rocket to hit the moon.

Goddard actually had speculated about such a mission in 1919, and by the time news of his ideas reached the Soviet Union, the public mistakenly believed such a launch was imminent. Many Soviet citi-



ASIF SIDDIQI



RON MILLER

zens were convinced that Goddard was planning his moon shot for the summer of 1924. One of the most famous popular science writers in Russia, Yakov Perelman, wrote a hugely influential piece on Goddard in a Moscow evening newspaper, *The Late News*, arguing that “future historians will remember 1924 as the date for one of the greatest stages in the development of technology,” and that “July 4 of the present year has been named as the date for sending [Goddard’s] first projectile to the Moon.” Perelman added that “victory is ensured and there is no more doubt that the day is near when the Columbes and Magellans of starry lands will pull away from Earth’s sphere into the open universe.”

Such hyperbole called to action many young Soviet university students. Some at the prestigious Zhukovsky Engineering Academy in Moscow, for example, established a “Society for the Study of Interplanetary Communications” in the spring of 1924. The group, probably the world’s first organized community for

studying space travel, served as a key conduit for updates about Goddard’s moon rocket. Many Russians anxiously awaited news about the purported July 4 moon launch—and were disappointed when news filtered through that the launch had been “postponed” to August. Summer turned to fall, and there was still no news, yet interest in Goddard soared. Responding to widespread fascination with the moon rocket, the society organized a number of public talks in Moscow, inviting prominent Soviet astronomers and technical experts to discuss the feasibility of Goddard’s project. Students hung artful posters announcing the lectures at Moscow street corners. At one event, advertised as “The Truth About... Professor Goddard’s Moon Projectile of August 4, 1924,” so many people showed up outside the conference hall that Moscow police on horseback had to be called to restore order when the crowd was refused entry. Popular demand was so great that the talks were repeated a few days later.

Tsiolkovsky helped create a space enthusiast network by publishing people’s names and addresses in the back pages of some of his publications from the 1920s. In this way, the space-obsessed could contact one another. Many Russians wrote to Goddard to find out more about his moon rocket. In its collection of Goddard papers, Clark University in Worcester, Massachusetts, has a telegram from one Soviet citizen that simply states: “Is it true you send 4 July racket [sic] to Moon.” Sometimes Goddard wrote back. During my recent visit to Moscow, archivists at the Russian Academy of Sciences showed me several letters from Goddard that no Westerner had seen since they were mailed more than 80 years ago. The Society for the Study of Interplanetary Communications received a note from Goddard in 1924 congratulating members on their group’s formation and indicating that he would be ready to cooperate with them. He also mailed them copies of his publications, but was careful to send only information that was already in the public domain. These brief contacts were the

The 1927 exhibit had a model of what some thought Robert Goddard’s rocket would look like. Right: A Gagarin stamp.



RON MILLER



ITAR-TASS

CLASS OF SERVICE	SYMBOL
TELEGRAM	
DAY LETTER	DL
NIGHT MESSAGE	NITE
NIGHT LETTER	N.L.

If none of these three symbols appears after the check number, it is a telegram. Other symbols are indicated by the symbol appearing after the check number.

WESTERN UNION
TELEGRAM

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PROFESSOR GODDARD CLARK
COLLEGE WORCESTERMASS

IS IT TRUE YOU SEND 4 JULY RACKET TO MOON

PRESIDENT RUSSIAN SOCIETY WORLDS KNOWLEDGE NICOLAI MOROSOV, TORGОВАЯ
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CLARK UNIVERSITY
WORCESTER, MASSACHUSETTS

DEPARTMENT OF PHYSICS

August 16, 1924

Mr. Leitgen, Secretary
Society for Studying Interplanetary Communication
Moscow Russia

Dear Sir:

I am glad to know that a society for studying interplanetary communication has been established in Russia, and I shall be glad to cooperate in this work, insofar as it is possible.

There has, however, been no printed material regarding the research work in progress, or the trial flight.

Thanking you for your interest, I am

Very truly yours,
R. H. Goddard
Director Physical Laboratories

B80-90

Goddard lauded the formation of a Soviet space society (above). Left: a Russian telegraphed Goddard about his moon rocket.



Sergei Samburov (left), admiring a model of the Mir space station with Energia's Oleg Tsygankov (center) and cosmonaut Alexander Polishchuk, works to keep his great-grandfather's legacy alive.

and architecture, Soviet artists produced works that reflected their belief that cosmic travel was an inevitable part of their future. Science fiction was a growing genre in the Soviet Union, and space travel was a major theme. Novels such as Alexei Tolstoy's *Aelita: Sunset of Mars* and Alexander Bogdanov's *Red Star* were immensely popular among space enthusiasts because the stories were grounded in plausible scientific and technical ideas. The movie version of *Aelita*, released with great fanfare in late 1924 under the direction of famed Soviet filmmaker Yakov Protazanov, successfully blended science with art. Probably the most famous space movie of the Soviet era, the film was about a proletariat revolution that takes place on Mars under the watchful gaze of Aelita, the planet's queen. The movie established a new standard for Soviet cinema, if not in quality, then certainly in popularity and hype. Weeks of intense advertising campaigns preceded its release, with airplanes dropping

first exchanges between Americans and Russians in the history of space exploration.

Goddard also wrote to the Association of Inventors, a ragtag group of students, workers, and at least one former mental asylum patient, who staged the world's first public exhibition on rocketry and space travel—a forerunner of today's space museums. The members referred to themselves as “citizens of the universe” or “cosmopolitans” who labored for the cause that human destiny lay in the cosmos rather than on Earth. Their exhibition, held in 1927 in Moscow, centered on Tsiolkovsky, whom the organizers held up as a prophet for a new era of space travel and an inventor who was “superior even to [Thomas] Edison.”

The organizers established a narrative of space history that has endured for decades. Visitors to the exhibition would start their tour with depictions of the fantasies of such writers as Jules Verne and H.G. Wells, and end with displays of finely made rocket and spaceship models inspired by the ideas of Tsiolkovsky, Goddard, Oberth, and other space pioneers, including Frenchman Robert Esnault-Pelterie, German Max Valier, and Russian Friedrich Tsander. Open to the public for two months, the exhibition had an elaborately designed entrance with a human-scale display of an imagined planetary landscape placed behind a large pane of

glass. Part of the display, somewhat incorrectly called “Lunar Panorama,” showed a hypothetical planet with orange soil and blue vegetation crisscrossed by straight canals. A giant silver rocket descended from the starry sky while a voyager in a spacesuit (made of plywood) stood at the edge of a crater.

The show was a hit with the Russian public. In two months, nearly 12,000 people, including schoolchildren, workers, service employees, artists, scientists, and policemen, bought tickets, and some recorded their impressions in a guest book. One artist from a state cinematographic studio wrote that “it would be desirable that our inventors achieve the first landing on the moon.” One of the more captivated visitors was S.G. Vortkin, a reporter for the workers' news daily *Working Moscow*, who wrote: “I am going to accompany you on the first flight. I am quite serious about this. Please do not refuse my request.”

The space fad infused the arts. From literature and movies to painting, poetry,



A post-Sputnik poster declares the Soviet Union “the motherland of cosmonautics.”

ping thousands of promotional fliers over major Russian cities. Tickets for the early shows sold out, and the size of the crowd on opening night in Moscow prevented even Protazanov from attending. The movie, which featured fantastic modern sets, romantic intrigue, and provocatively dressed women, made a deep impression on many young people. Forty-five years later, Soviet rocket designer Vladimir Chelomei, who was 10 when the movie came out, named his proposed mission to send cosmonauts to

Mars “Aelita.”

One of the most important Soviet avant garde art movements of the period, Suprematism, also reflected a deep interest in space. Although it originally emerged as a variant of Cubism, Suprematism went much further in its experimentation, dis-

persing with representations of conventional space and perspective. Such an approach led many Suprematists, including the movement's leader Kazimir Malevich, to eulogize first aviation and then the cosmos. In one artistic manifesto, Malevich proudly proclaimed that "between the Earth and the Moon, a new Suprematist satellite can be constructed Follow me, comrade aviators! Swim into the abyss." Many of Malevich's protégés were technological utopians, captivated by the potential power of science to emancipate society from its ills. Some artists even made the pilgrimage to Kaluga to visit with Tsiolkovsky, who was only too happy to share his ideas.

The Soviet space fad began to recede once Joseph Stalin tightened his grip on Soviet society. Some enthusiasts perished in the Stalinist purges of the 1930s. In 1939, the Soviet security services shot and killed Morris Leiteizen, who nearly two decades before had served as one of the leaders of the Society for the Study of Interplanetary Communications. Similarly, Mikhail Lapirov-Skoblo, one of the earliest promoters of spaceflight, ended up in the Gulag and died in confinement after World War II.

Most space activists, however, were brought down to Earth by the economic realities of the day as the Soviet government invested heavily in brute force industrialization and military rocket development. Space had no purpose in this vision. Many enthusiasts also lost interest once they realized that space travel was years, if not decades, away. Society chief Grigory Kramarov later recalled that the most common question from the audience after each lecture would be "How quickly would flight to the planets be accomplished?" When it became clear that there was no good answer, many members dropped out, leaving only a handful of the truly dedicated to pursue the cause. Like many utopians, society members were unable to sustain a vision beyond the short-term.

Yet, ultimately, the space fad left a powerful legacy. It convinced young Soviet citizens that spaceflight was not only possible but inevitable, and that conviction has been handed down generation by generation from the 1920s to today, a point that Samburov reminded me as our train pulled into Kaluga and we took a cramped

minivan to the cosmonautics museum named after his great-grandfather. While the rest of the world was shocked by the successes of Sputnik in 1957 and Yuri Gagarin in 1961, most Soviet citizens fully expected and anticipated that their country would be first in space. After all, they had started their space education long before Sputnik's launch. Even Korolev, the Soviet space program's chief designer, invoked Goddard's fabled moon rocket of the 1920s in his request in 1958 for government funds to send a probe to the moon. Korolev got his wish, and in September 1959 the Soviet Luna 2 probe hit the moon—one of the great firsts of the Space Age.

At Tsiolkovsky's former home, now preserved as a museum, Samburov lovingly showed me some of his great-grandfather's space materials, amassed over the four decades Tsiolkovsky lived in Kaluga, until his death in 1935 at age 78. Samburov, born long after that, grew up in the house and recalls being thrilled as a little boy when Gagarin paid a visit to Samburov's family in the early 1960s. It had a lasting effect: Besides his work promoting his great-grandfather's legacy, Samburov works for RKK Energia, helping to train cosmonauts aboard the International Space Station in radio communications. "We take our space history very seriously," he said.

Later, Samburov showed me an array of Tsiolkovsky mem-

Soviet astronautics pioneer Konstantin Tsiolkovsky's statue is part of a monument to spaceflight in a park in Kaluga, his hometown.

orabilia: information pamphlets on the cosmos, mathematical monographs, drawings of objects in zero gravity, science journals depicting futuristic rockets, and letters from admirers. Looking at the materials felt strange, even surreal. In Western books and articles, one sees the usual iconic pictures of the early Soviet space program, in second- and third-generation reproductions. But as a historian of the Russian space program, I found it both thrilling and humbling to hold these documents—some nearly a century old—in my hands. Samburov invited me to sit at Tsiolkovsky's desk, in the same chair he used when he wrote his groundbreaking works on cosmonautics. Strewn on the desk were journals, pamphlets, and sketchings from a bygone era. Looking at these futuristic renditions of rockets and spaceships, it was easy to imagine how an old Russian schoolteacher might have let his imagination run free. ➔



ASIF SIDDIQI



CALLING ALL MUSTANGS

THIS SEPTEMBER A SUPER-SIZE SQUADRON OF P-51s WILL
RELIVE THE LEGEND.

ART TEETERS RECALLS A PERSISTENT customer showing up at his aircraft repair shop in the late 1970s. "This gentleman owned a P-51 and kept asking us to rebuild it," he says. "I kept turning him down. At the time, I just didn't see any way that Mustangs could ever be a viable business."

Teeters eventually relented, and his Salinas, California-based company, Cal Pacific Airmotive, is now one of the oldest warbird restorers in the world, and among a handful to work on North American P-51 Mustangs exclusively.

Rebuilding personal sport Mustangs like that first one, followed by a string of racers, occupied Teeters' facility for the next decade. "But that day is long gone," he says now. The finite number of surplus P-51s has shifted the company's restorations from simply making the fighters airworthy for a weekend outing toward expensive, historically correct military makeovers.

BY STEPHEN JOINER

Teeters traces the transition to the ambitious owner of a particular Mustang and the random path of a hurricane: "It would have to be Kermit Weeks and *Cripes A'Mighty 3rd*," he says. "The popularity of that one airplane after its first restoration [in 1983] struck up an interest in historic authenticity. Kermit put a lot of effort into getting it right, and that really caught people's fascination." In 1992, however, Hurricane Andrew leveled the Weeks Air Museum in Tamiami, Florida, severely damaging *Cripes* and most of the other aircraft in the collection. A subsequent rebuild, this time by Cal Pacific, further raised the standard of fastidious historic restoration. Public appreciation of the greatest generation's greatest fighter grew, along with interest from wealthy warbird aficionados. After *Cripes A'Mighty* won an unprecedented second Experimental Aircraft Association Grand Champion award at the Oshkosh, Wis-

INA the Macon Belle will roar through the skies over Columbus, Ohio, along with dozens of other Mustang beauties.





TYSON RININGER

Art Teeters has been restoring North American P-51s for 30 years. His Salinas, California-based company is one of a handful that specializes in historically accurate Mustang makeovers.

consin fly-in in 1999, “things really took off,” says Teeters.

And they show no sign of leveling. Cal Pacific stays booked years in advance, and, like most Mustang restorers, it has never had to advertise. The painstaking, total-teardown process, often requiring more than 25,000 man-hours, can’t be hurried. Eager to hear the rumble of a Rolls-Royce Merlin engine, potential owners often find their enthusiasm dampened by the notably quiet three- to five-year delivery time. “A lot of people would love to own a Mustang, but that timeline really turns them off,” says Teeters. But Cal Pacific says that patient dedication pays dividends in authenticity. “Our commitment is this: After we’ve restored your airplane, no one will be able to tell it from an original, inside or out.”

Just as no quick-and-dirty P-51 restorations are to be had anymore, neither are

there many economy models. A surprising number of Mustangs, for example, are still flying on original, 60-year-old wings. “But the guy who buys one of those today for just \$1.2 million is probably going to end up having to put another million and a half into it three years from now,” says Teeters. Cal Pacific insists upon replacing original wing spars with historically accurate but newly manufactured equivalents at the time of restoration.

Customers sometimes get sticker shock, but in the cosmos of modern Mustang ownership, buyers’ remorse is rare. “I remember the first really authentic restoration we did years ago,” says Teeters. “We put about \$300,000 into it, and I just felt terrible about the owner having to pay out that kind of money. But then he turned around and sold it for three times that much.”

When Mustang aficionados aren’t busy



restoring and flying the airplanes, they like nothing better than to hang out with other P-51 owners. For four days beginning on September 27, P-51 pilots will fly in to the Gathering of Mustangs & Legends: "The Final Round-Up," a follow-up to a 1999 fly-in held in Kissimmee, Florida (see "Mustang Mania," June/July 1999). This year's event, which will be held at Rickenbacker International Airport in Columbus, Ohio, will feature a 51-Mustang formation, solo flight demonstrations, and an auction. The following seven Mustangs will be among the nearly 100 airplanes expected to attend.

SIX SHOOTER

Chuck Hall

Ramona, California

"Thirty years ago it was just guys like me," Chuck Hall says of the experience of Mustang ownership. "All you really needed

was a love of aviation."

We're sitting in his office at bustling Ramona Airport, the facility he developed from an abandoned U.S. Navy strip in the desert mountains of northern San Diego County. Out on the ramp, after a night of frost alarms in the orange and avocado groves, a Russian Yak 52 is having trouble firing up in the cold.

"Now, you need a million bucks," says Hall.

He bought his first P-51 in 1965 for just \$9,000: "Read the manual, jumped into the cockpit, flew it away." After racing the modified Mustang for years, Hall sold it and bought *Six Shooter*, a fully restored fighter that had seen service as a counterinsurgency aircraft in Bolivia. It's now one of the best known Mustangs in the west and a star of the U.S. Air Force Heritage Flight Team.

Hall's long aviation career, chronicled by the array of mementos in his office, began in his late teens when he ferried Korea-bound troops in a Douglas DC-4 for Alaska Airlines. Years later, he was flying Boeing 747s for Japan Airlines and *Six Shooter* in airshows. "No, you would never confuse one with the other," he laughs. "From a handling standpoint, the P-51 is really more demanding. It's actually possible to relax and fly a 747."

Hall's P-51, the representative vintage World War II airplane on the west coast Heritage Flight Team for the past decade, averages 18 airshows per year. The 65-year-old Mustang flies in a dramatic then-and-now formation with operational F-16s and A-10s—a photo-op for thousands of fans. I ask about protocol in such situations. "If I'm in the lead, I'm pulling the maximum continuous power, and the jets adjust to me," he explains. "If the jets are in the lead, well, we have to educate those guys about

just how fast they can fly." Heritage Flight teams undergo intensive training annually at Arizona's Davis-Monthan Air Force Base (which often includes taking the jet pilots up in *Six Shooter's* second seat).

The Yak finally roars to life, and Hall and I head outside. He slides back the door of the prefab metal hangar where *Six Shooter* is stabled, and hands me a stepladder. I climb aboard. The height and pitch of *Six Shooter's* wings are striking, the depth and confines of the cockpit claustrophobic. Hall points out that Mustang pilots in World War II flew eight-hour missions in the constrictive seat; afterward, ground crews had to lift them out. Even in the quiet and cold of the hangar, with the stilled instrument faces staring back at me, the vibe of dormant power is palpable.

En route to Heritage Flight Team shows, Hall has the clearance to land at military bases; on the trip to Columbus, however, he'll be putting *Six Shooter* down at small civilian airports. It probably won't be necessary to announce his arrival. "The Mustang has a sound all its own," he says. "We always draw a crowd."

PETIE 2ND

Tony Buechler

Waukesha, Wisconsin

Tony Buechler is always ready to learn more about the history of *Petie 2nd*. "One day in the operating room I was informed I had a long-distance call," says the anesthesiologist. "I was on an open-heart case so I said, 'Well, I'm kind of busy at the moment.' Then they told me, 'It's about your airplane.' I said, 'Put 'em on.'"

The caller identified himself as a long-ago owner who had bought Buechler's \$1.5 million P-51 as flyaway surplus in 1957. He had paid \$755. "Ouch," says Buechler. Another historic detail added.



Chuck Hall flies *Six Shooter* in some 18 airshows a season. Once a year, he trains intensively at Davis-Monthan Air Force Base to fly formation Heritage Flights with current Air Force inventory, including Fairchild Republic A-10s.

© BRITT DIETZ

EVELYN HALL

As World War II ended, thousands of Mustangs were still Stateside, queued for deployment. These make up the majority of the world's 154 airworthy P-51s today. Buechler found out his Mustang was an exception.

Few of the Mustangs that served in overseas combat theaters ever came back. "After the government saw the captured German jets, it was obvious that the future did not belong to prop-driven fighters," says Buechler. Some were sold to friendly countries, the rest scrapped at their battle stations.

A voracious researcher, Buechler has left no document unexamined. "I've gotten copies of combat records on microfiche from the Air Force," he says. "I've combed through hundreds of daily operational records. I've spent uncounted hours at the Air Force archives in Dayton" and at the National Air and Space Museum in Washington, D.C.

Before being restored Stateside, *Petie 2nd* flew combat missions with the 15th Air Force in the European theater, making it a rarity among still-flying P-51s, the majority of which never saw action.

Buechler eventually traced his P-51's deployment to the Mediterranean theater of operations, where it flew with one of four fighter groups of the 15th Air Force. "The curator in Dayton evaluated my research and told me, 'You've got one of only a half-dozen or so existing Mustangs that was actually shipped directly back from Europe after combat,'" says Buechler. After that, the P-51's trail disappeared into the undergrowth of history. Which for Buechler only makes it more tantalizing. One of the 15th Air Force fighter groups was a Tuskegee unit. "So there's a one-in-four chance that my plane could be the only surviving Tuskegee P-51 in existence," he says. Though he's still chasing records, posting messages, and taking calls, Buechler admits, "I've kind of given up ever finding out for sure."

While booms and bubbles define the investment sector of the vintage-aircraft world, Buechler is oblivious to it all. "I've never given any of that a thought," he says. "To me, this is an historical artifact, and I'm its custodian. If somebody wanted to chop it up and make it a racer and offered me three million bucks for it, I'd say, 'Not for sale.'"

SCAT VI

Marius Maxwell

Rapid City, South Dakota

After the war, the mystique of P-51s spread far and wide, particularly in the European skies they once ruled. "Ever since I was a kid in Britain," says Marius Maxwell, "I saw Mustangs at airshows and I was mesmerized."

Now a Rapid City neurosurgeon, Maxwell owns *Scat VI*, a P-51 painted to honor the Mustang of the same name flown by legendary U.S. Air Force ace Robin Olds (who died last June).

Once owned by IBM president Tom Watson, the fighter was named *Old Boy* when Maxwell acquired it in 2002. "I started thinking of how I could change the theme of the plane," he says. "Robin Olds had always been my favorite ace." A triple ace from his tours in World War II and Vietnam, Olds named each of his fighters *Scat*, in memory of a fallen comrade. His favorite was *Scat VI*—"the sweetest and truest Mustang I ever flew," he once told Maxwell.

Maxwell researched *Scat VI* and had the markings and color scheme duplicated. But his airplane's connection to the living pilot of the original fighter exceeds paint





Marius Maxwell (above) had his P-51 Mustang painted like *Scat VI*, flown by his favorite ace, U.S. Air Force pilot Robin Olds (right). Of all the P-51s assigned to him, Olds called *Scat VI* the “sweetest and truest Mustang I ever flew.”



COURTESY DR. MARIUS MAXWELL

depth—an association increasingly uncommon in World War II warbirds as the decades accumulate. Owner and ace struck up an acquaintance and have since collaborated in a history forum at the EAA’s annual fly-in in Oshkosh, with *Scat VI* displayed as the ultimate show-and-tell. “He’s a real historian,” Maxwell says of Olds. “People ask all sorts of questions and just listen in stunned silence to his stories.”

The Mustang effect appears to work both ways. Maxwell notes its impact on Olds: “You can see it in his eyes when he’s around the plane,” he says. “It seems to take him back to his life as a young man.” Later, Olds confirmed that impression. “It’s like meeting an old girlfriend you once loved with all your heart and soul,” he told me on the phone. “I just loved P-51s.”

The association with Olds gives his aircraft “a persona,” says Maxwell. When I inquire about a contemporary photograph

of *Scat VI*, Maxwell immediately suggests a World War II-era shot of Olds with the original *Scat VI* instead. “You don’t want any pictures of me,” says Maxwell. “I’m just the owner. Robin is the ace.”

INA THE MACON BELLE

Kermit Weeks

Polk City, Florida

“The coolest day of my life was the first time I taxied up to a ramp in a P-51 Mustang,” says Kermit Weeks. “I threw my bags out and started giving rides.”

The year was 1979, and Weeks was flying his first Mustang, a P-51D named *Cripes A’ Mighty 3rd*. Six years later, Weeks purchased a C-model that he restored and named *INA the Macon Belle*, representing the legendary Red Tail Mustangs of the Tuskegee airmen. The man who flew the original *Macon Belle* had some cool himself: Colonel Lee Archer had been one of

the top pilots of the 332nd Fighter Group, which flew in the European theater.

A prominent figure in the warbird community, Weeks has spent the last 30 years assembling the largest private collection of vintage aircraft in the world, which he stores at the Fantasy of Flight museum. The Mustang that would become *Macon Belle* was rescued from a scrap yard by renowned Hollywood stunt pilot Paul Mantz, who fixed it up and put it to use winning the Bendix racing trophy in 1948. By the time Weeks got the P-51, it was badly corroded from years of outdoor storage.

“There was something I’d been thinking about for some time,” says Weeks. “Why hasn’t anybody restored a Mustang to honor the Tuskegee guys?” The airplane arrived at Cal Pacific Airmotive in installments, beginning in 1985 with the wing. The piece-by-piece rebuild spanned 15 years (“I wasn’t in any hurry,” says Weeks). No expense was spared to achieve authenticity, an exhaustive pursuit that occasionally turned up discrepancies. “We found out that a lot of the research out there about the Tuskegee planes was wrong,” says Weeks. The art on *Macon Belle*’s fuselage—a fedora-wearing hipster—is one example. Researchers initially based the drawing on photographs of a similar character on Tuskegee Captain Wendell Pruitt’s Mustang. “Everyone just assumed that the drawing on *Macon Belle* must have been the same,” Weeks says. An opinion from the man who actually flew her settled the matter: “Colonel

JOHNNY SUNDBY PHOTOGRAPHY

Archer was consulted and set it straight,” says Weeks. “He told us, ‘No, it was not the same, and here’s exactly how it was different.’ He was absolutely involved throughout the process [of authenticating the paint scheme].” (Archer plans to attend this year’s gathering.)

Weeks can envision a future without the dramatic spectacle of Mustangs in flight. “Because of the economics, most P-51s will inevitably end up in the hands of collectors,” he says. “And they won’t fly

them [like the enthusiast pilots have done].” So when *Macon Belle* touches down at the former Tuskegee air base in Columbus and takes her place among the other still-flying Mustangs, Weeks expects an experience even more compelling than the 1999 event in Kissimmee. “The first Gathering was phenomenal,” he says. “For [event organizer] Lee Lauderback to try to pull that off a second time really shows his love for the airplane and the Mustang community.”

SWEET AND LOVELY

Bob Baker

Alva, Oklahoma

In today’s white-hot market for big-ticket P-51s, million-dollar restorations are carried out at specialized shops while expectant owners bide their time on waiting lists.

Or not. “I really don’t know why I do it like this,” laughs Bob Baker. What he does is restore Mustangs—mostly by himself, mainly from a loose collection of parts, and almost entirely in his home workshop in Alva, Oklahoma. “There are definitely easier ways,” he says. Not necessarily better ones, however: Baker’s most recent do-it-yourself project, a P-51D named *Sweet and Lovely*, won the Best Fighter award at Oshkosh in 2003 and was Grand Champion in 2004; it remains one of the world’s most authentic D-model restorations.

“I had a lot of P-51 parts I’d gathered over the years,” Baker says of *Sweet’s* in-

INA the Macon Belle owner Kermit Weeks has the world’s largest private collection of vintage aircraft.



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Rickenbacker Revival

THE DAY BEFORE the 1941 Japanese attack on Pearl Harbor, the area east of Lockbourne, Ohio, was fertile farmland. The day after, the U.S. Army announced that it was turning the land into an air base. In the ensuing years, the base would witness a rich era of U.S. aviation history, from glider trainers to 'round-the-clock Strategic Air Command sentinels.

“The gliders didn’t last long,” says Don Porter, a military historian who is co-writing a book about the base. “By the end of 1942, Lockbourne was all B-17s, all the time.” Nearly 4,000 bomber pilots were trained at Lockbourne Army Air Force Base, many of them women: The base was an early training facility for Women Airforce Service Pilots, who ferried combat aircraft to and from U.S. bases. “At first they checked out in B-17s,” says Porter. “But

eventually they flew everything that landed here.”

Postwar, Lockbourne was home to the 332nd Fighter Group, known as the Red Tails—African-American pilots who had trained at Tuskegee Army Air Field in Alabama.

“It was way out in the sticks in those days,” retired Lieutenant Colonel William Holloman recalls from his home in Seattle. “Yet very overcrowded.” Holloman graduated from Tuskegee and flew P-47s and P-51s in combat in Europe. In 1946 he joined the rest of the 332nd at Lockbourne.

The Tuskegee Airmen were stymied by a ratio of two pilots for every available airplane; “You really had to fight for flying time,” Holloman says. Though many of the postwar P-47s allocated to the Tuskegee squadrons were fresh off Republic’s assembly line, P-51s in any condition were scarce. To



121ST AIR REFUELING WING

A training base for Boeing B-17 bomber crews in 1943, Ohio’s Lockbourne Army Air Force Base hosted the Tuskegee-trained 332nd Fighter Group after the war.

stay sharp in the demanding fighter, Holloman and others resorted to borrowing P-51s from a National Guard unit on the other side of the base.

Holloman remembers off-duty hours with mixed feelings. Social activities at the Lockbourne Officers’ Club were plentiful: “We owned that base,” he laughs. “But you have to

remember that Ohio was still fairly racist back then, and there weren’t many other places we could go that welcomed us.” They did not venture into nearby Columbus very often.

By 1950, the Jet Age was arriving at Lockbourne. Porter, who was an airman assigned to SAC in the 1950s, recalls the rapidity of the transition. “One



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ception. "I bought stuff. I made stuff." When a portion of that accumulation added up to a fuselage and a wing, he had them built at restoration shops, then trucked them back to Oklahoma, where he set to work fashioning a complete airplane. Baker, by day a farm implement dealer, describes the three-and-a-half-year effort as "humbling." Also all-consuming.

"The first thing you learn about restoring a Mustang is there's no such thing as spare time," he says. "Every day after work I'd designate several hours a night on it, and

Bob Baker (left) spent three and a half years restoring *Sweet and Lovely*, a D-model Mustang that was Grand Champion at Oshkosh in 2004.



day I landed, and the entire field, up and down, was suddenly lined with B-47s," he says. Cold war realities drove other changes: Runways were lengthened and reinforced to accommodate heavy bombers carrying nuclear payloads.

The base continued to expand through the Vietnam War, serving as headquarters for Air Force Defense Command and Air Force Communications Command units. At its height, more than 18,000 military personnel were stationed there. In 1974 the base was renamed Rickenbacker Air Force Base, in memory of World War I ace Eddie Rickenbacker, who grew up in Columbus.

By the late 1970s, with the Vietnam War ended and cold war tensions cooling, "you could really see things winding down," says Porter. In 1980, the national trend of closing bases finally reached Rickenbacker: It was shut down, though the facility remained intact for the Air National Guard.

The economic impact – a loss of more than 12,000 jobs in the region – inspired an uncommon joint-use agreement between the military units still active there and major corporations interested in designating the airport a foreign-trade zone. Agreements were struck to choreograph the take-offs and landings of military and civil aircraft.

Eventually, the airport began drawing industrial activity, starting with the establishment of a Federal Express hub in the late 1980s. "There was a time when it seemed like a new warehouse sprang up every week, some of them a quarter-mile long," says Porter. Cargo aircraft bound for the vast sorting and distribution facilities of companies like Siemens now share the airport with Boeing KC-135 tankers and Black Hawk helicopters. "It's been a total turnaround," Porter says of the revitalization.

Seven years after the highly successful 1999 Gathering

of Mustangs & Legends in Kissimmee, Florida, organizers at Stallion 51, an operation offering orientation flights and check-out training, solicited letters of interest from airports around the country to host a repeat event. In a hotly competitive selection process, Rickenbacker prevailed. Rod Borden, chief operating officer at the Columbus Regional Airport Authority, attributes the coup to two advantages: "The first is the quality of our facility. Two 12,000-foot runways and a ton of apron. The second has to be our history. We're proud of that connection to the Tuskegee Airmen and the World War II training that happened here."

Groundwork for the gathering involves everything from transforming airport-owned farm fields into temporary parking areas to integrating about a hundred 60-year-old Mustangs into Rickenbacker's 24/7 flux of time-critical military and cargo aircraft. "We'll have a plan in place to work in and

around our commercial operators who need to get in and out," says Borden. "But for itinerant traffic, we're essentially closing the airport and diverting them to our other facilities."

Rickenbacker last hosted regular airshows in the 1990s, and Borden expects the Gathering of Mustangs & Legends to outdraw those. "We have a population that hasn't seen a major show for over 10 years, and they're hungry for it," he says. He doesn't rule out the possibility that the gathering could jump-start that lapsed tradition.

Early concerns that Rickenbacker's heartland location would discourage owners west of the Rockies have vanished in an assertion of Mustang Attitude all the way to California – and even beyond. "We just had a call from a guy in Australia who owns a P-51," Borden reports. "He told us he intends to crate it up and ship it here."

then devote all of Saturday and most of Sunday too.”

Sweet’s strict observance of historic detail, however, was not a one-man effort. Baker spent a lot of time networking. “We all help each other,” he says of the community of Mustang restorers. “Somebody will find an original part still in a box someplace and every detail—how it was painted, what sort of markings were on it—is shared with all the others.”

Baker made his own contribution to the database for drop tanks. Concerned about dumping thousands of empty steel fuel tanks on unfriendly territory during the war—gifts from heaven to enemies suffering metal shortages—the Allies began fabricating P-51 drop tanks of rubber-coated cardboard. Today, only three 108-gallon “paper” tanks are known to survive, and two of those are locked away in museums. Through a contact in the United Kingdom, Baker acquired the last available example, and from that original he has produced a template for use in building exact replicas of the tanks.

Though Baker is now burning the midnight oil on another Mustang restoration, his workshop will be dark the last week of September, when he’s in Columbus. “I’m expecting a tremendous amount of history, and a tremendous amount of fun,” he says.

NACA 127

Bill Allmon

Las Vegas, Nevada

“Birds’ nests. Corrosion. A basket case.” Bill Allmon recites his impressions from the day he first kicked the tires on NACA 127 in 1993. He was in the market for a fixer-upper, so he bought it on sight. As the forlorn Mustang’s remarkable past came to light, however, Allmon committed to a rivet-by-rivet—and eventually award-winning—professional restoration. “I realized that it was an important part of history, and that we should put it back the way it was,” he says.

By 1945, research into breaking the sound barrier had hit a wall: Wind tunnels were unable to generate supersonic airflow over test models. After a number of alternatives for producing data at those velocities (including dropping concrete projectiles from 40,000 feet) were discarded, researchers at NASA’s precursor, the National Advisory Committee for

Aeronautics (NACA), turned to a military aircraft capable of a controlled dive at near-transonic speeds: the P-51 Mustang.

Allmon’s NACA 127 is one of at least four P-51s that had been assigned to those early experiments. Only one other still flies today. At NACA’s Langley, Virginia laboratory, models of airfoils under study for supersonic flight were mounted on a blister atop 127’s wing. The airfoils were wired to optical balances and strain gauges installed inside wing cavities ordinarily occupied by .50-caliber machine guns. Behind the pilot, a fuel tank was replaced by a bank of telemetry recorders and transmitters. NACA Mustangs were typically flown to an altitude of 30,000 feet, then accelerated into a 30-degree dive. Though actual airspeed would max out at about 475 mph, “during the 4-G pullout at the end of the dive, airflow over the top of the wing would go supersonic,” says Allmon. Data from these experiments shaped the design of sonic boomers like the Bell X-1 and the North American F-86.

Despite its historic role in the ramp-up to supersonic flight, 127 spent its retirement in obscurity as a generic Mustang displayed on a pole outside a Pennsylvania Air National Guard base.

Soon after it was taken down to make way for a fiberglass replica, Allmon saw photographs of it. “I’d wanted one since I was a kid,” he says.

Meticulously faithful to all NACA modifications and instrumentation, the four-year restoration of 127 was done by John Muszala at Pacific Fighters in Idaho Falls, Idaho. Muszala restored and preserved all the details, even pencil scribbles NACA technicians had made on the airframe more than 60 years ago.

“Honest to God, I’m still thrilled by it,” says Allmon. “Every time I start it and hear the crack of the exhaust, I’m speechless.” Though his crowded business calendar has restricted NACA 127’s airshow appearances in recent years, Allmon is making room for the Gathering of Mustangs. “It’s a once-in-a-lifetime thing,” he says.

SPARKY

Steve and Brant Seghetti

Vacaville, California

Before they were *objets d’art* in museums, before they cricked the necks of worshipful airshow spectators, postwar P-51s were bare-metal racers. Widely available at surplus prices in the late 1940s and ’50s, the combination of a 12-cylinder Rolls-Royce



During the 1940s, NACA 127 was part of a fleet of P-51s used to test airfoils made for transonic and supersonic flight. Data gathered from the experiments helped the National Advisory Committee for Aeronautics design the Mach-busting Bell X-1.



engine and combat-grade maneuverability made P-51s a natural for pylon-shaving.

The competitive tradition persists today. In Vacaville, California, Steve Seghetti and his son Brant are owners/operators of *Sparky*, a Reno racer that took second place in its class in 2006. “Dad was bit at a really early age,” Brant explains. “He decided that someday he had to have a Mustang.”

The Seghettis acquired *Sparky* in 1984, “strictly as a VFR pleasure plane,” says Brant. But 10 years later, the Mustang racing gene asserted itself in *Sparky*, and father and son took the aircraft to Reno. While the Nevada race includes classes for highly modified vintage airplanes, Steve and Brant opted to keep *Sparky* in the class reserved for standard-issue warbirds. “It’s purely a stock

airplane, and we’re proud of that,” says Brant. “We don’t want to modify it. We want to race it original, finish well enough to put some money in the airplane kitty, and fly it back home Monday morning.”

In a P-51, even standard-issue flight is electrifying. “It’s absolutely the most fun you can have with other people watching,” says the younger Seghetti, who pilots a Cessna Citation charter jet for a living. “*Sparky* flies every bit as good as it looks.”

The P-51’s boffo paint scheme was designed by the Jelly Belly candy company, which sponsors *Sparky* by underwriting fuel and other expenses. “This is not a poor man’s airplane, not anymore,” says Brant.

Despite swelling prize purses, the com-

Sponsored by candy manufacturer Jelly Belly, *Sparky* competes as a standard-issue warbird at the National Championship Air Races in Reno, Nevada.

munity of owners/racers retains a relaxed camaraderie. “That’s one thing that keeps us going back to Reno every year,” says Brant. “It’s really like the reunion of a big, extended family.”

A last-minute weather change quashed plans to fly *Sparky* to the 1999 Gathering of Mustangs, but the Seghetti family team is committed to the 2,400-mile trip to Columbus this fall. Brant doesn’t rule out desperate measures. “Even if I have to buy a ticket on an airline to get there, there’s no way I’m missing it this time,” he says. —

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READ AN INTERVIEW WITH WILLIAM HOLLOMAN (see sidebar, p. 46), a retired Air Force lieutenant colonel and a Tuskegee-trained pilot who flew P-51 Mustangs with the 332nd Fighter Group in Europe. Holloman, who became the Air Force’s first African-American helicopter pilot, loved flying the P-51 and plans to attend this year’s Mustang gathering in Columbus.



Northern

EXPOS

**WE'VE ALREADY
SEEN WATER ICE
ON MARS. NASA'S
PHOENIX LANDER
WILL REACH OUT
AND TOUCH IT.
BY CHARLES PETIT**

URE



CORBIS WASTE/JPL

THE SQUARE, EARTH-TONE industrial building on North Sixth Avenue in Tucson, Arizona, has little of the proud, high-tech gloss of NASA's Jet Propulsion Laboratory, traditional home of U.S. Mars missions. The historic NASA center in Pasadena, California, has neatly clipped lawns and squadrons of badge-wearing engineers and scientists, who work each day surrounded by memorabilia from decades of solar system exploration. Everything about the place fairly shouts *Space science is our business*.

But around this building in Tucson's commercial flatland, the ambience is quite different: There's a car repair shop, a day care center, a small dinosaur museum, and the hum of passing traffic. The main clue that something unusual is going on is the exuberant yellow and orange mural painted along one of the building's broad sides. The work of art students from the University of Arizona and local high schools, it depicts a fiery trail from Earth to Mars, along which travel a chariot, a bird with flames for feathers, and an interplanetary robot.

A small sign near the entrance tells visitors that this is the home of Mars Phoenix, which happens to be the only mission bound for the Red Planet this year. NASA will launch the spacecraft in August and

guide it to a landing on the Martian surface in May 2008. Once it arrives, though, day-to-day operations will be run out of this building, near the university campus. It's a new model of doing business for a new generation of smaller, leaner, more innovative Mars Scout missions.

NASA sees these missions as a way to encourage fresh thinking: Ideas for Mars missions are proposed by scientists working outside the space agency rather than by staff scientists within. The Scouts augment bigger and more expensive missions like the *Spirit* and *Opportunity* rovers, which have been exploring the planet since 2004. The cost of the Mars Phoenix, about \$400 million, is roughly half that of a typical NASA mission to Mars.

The Phoenix team seems to like the low-budget arrangement just fine. "The advantage of the Scout mission concept is that the whole thing is determined by the scientists who are working on it," says Peter Smith, the mission's tall, plain-spoken principal investigator. "The usual NASA strategy is to have a spacecraft with some general goals, and then scientists propose instruments for it. You get committees and overlaps and competing personalities." The Scout teams are smaller and more collegial. The 25 co-investigators under Smith (compare that to 57 on the rover team) are a disparate bunch: eight from U.S. universities, nine from NASA centers, four from private contractors, and four from institutes in Britain, Germany, and Switzerland.

Together, they hope to take the next

Ice on the floor of a Martian crater, as photographed by Mars Express from orbit. The Phoenix lander (artist's conception, above) will use its robotic arm to dig into the Martian permafrost.

ESA/DLR/FU BERLIN (G. NEUKUM)

step in understanding a world that has become a familiar destination for planetary robots. For at least a decade, the mantra for NASA's Mars exploration program has been "Follow the water." If Martian life ever existed, the logic goes, the evidence would most likely be found in a zone marked by the presence of water. The current rovers have therefore spent more than three years examining rocks formed under wet conditions long in the past.

The Phoenix mission comes about as close to a single-minded search for water as anything NASA has done so far. While the *Spirit* and *Opportunity* rovers have done a good job of tracing the history of water, scientists hope that Phoenix will be the first spacecraft to directly sample it. "Everybody talks about water [on Mars], water signatures, water this and water that," says Smith. "But they've never *seen* any." Nor will Phoenix, at least not in liquid form. Scientists would be astonished to find running water on the Martian surface today—it's far too cold. Water ice, though, is very likely to be found where Phoenix will touch down.

The lander will head straight for the Martian arctic and the broad belt of permafrost surrounding the planet's north polar cap. Next May, if all goes according to plan, Mars Phoenix will bore into the atmosphere near the north pole at 12,600 mph. A heat shield, then a parachute, then a set of landing jets will reduce the craft's speed until finally the 800-pound lander thumps down on three legs at about 5 mph.

As with any planetary lander, this will be a harrowing time for the Phoenix team. "Seven minutes of hell" is how NASA project manager Barry Goldstein, who'll be at JPL during the mission, describes it.

Once Phoenix is on the ground, two circular solar panels will extend from its sides and open like Chinese fans to provide power. A column of delicate tubing will rise like a stalk, with a stereo camera on top for panoramic photography. From the lander's flat deck will extend a robotic arm equipped with small cameras, microscopes, and, most important, a shovel and small electric grinder—the same kind used for sculpting ice. Articulated like a backhoe, the arm can in principle dig a trench about two feet deep, at least in soft ground. The whirring grinder is designed to break frozen ground into manageable bits for the shovel to scrape up. Nobody expects the grinder to penetrate more than a fraction of an inch into the permafrost, which will be deep-frozen to about -130 degrees Fahrenheit.

Mission scientists believe the lander will find ice mixed with the soil just below the dusty surface. And some researchers, like Ray Arvidson of Washington University in St. Louis, a co-investigator with the robotic arm science team, expect to see, on close inspection, patches of hard, blue ice peeking through.

All previous Mars landing missions have been dusty affairs. This could be the first one to make mud. After the arm collects the frozen samples, they'll be placed

in miniature ovens and heated for study. A suite of instruments (see "Land, Look, Dig, Cook," p. 55) will inspect the soil and meltwater for organic molecules and other signs of biochemical activity. Ratios of hydrogen and deuterium (an isotope of hydrogen) should tell scientists whether the ice in the permafrost came from ancient groundwater or fell as rain. Meanwhile, a meteorology package provided by Canada will take weather readings; the pressure gauge comes from Finland, the wind sensor from Denmark. Phoenix's cameras will inspect the shallow trench dug by the arm, looking for layering or variations in chemistry that would indicate whether liquid water existed at the site. The planet's orbit and axial tilt change in cycles lasting tens of thousands to millions of years. That means there may have been epochs with warmer summers during which water persisted on or near the surface within the past 100,000 years. Phoenix will help scientists piece together that story.

The "nominal" mission—the length of time needed to achieve the major scientific goals—is three months. That's how long the sun will stay high enough for the spacecraft to produce sufficient electrical power to run its robotic arm and shovel. Plans are to go through seven digging cycles, each lasting about eight Martian days, or sols (a Martian day is 37 minutes longer than an Earth day). By December, as the sun drops too low to keep the batteries charged, the spacecraft should begin dying. By the time the sun rises again in the Martian spring, the craft "may be buried up to its deck in carbon dioxide snow," or perhaps frost, Smith says.

A student-painted mural on the Phoenix control center in Tucson depicts the perilous journey from Earth to Mars. Half of all missions to the planet have failed.



AT THE TUCSON OPERATIONS center last November, things were fairly quiet. The spacecraft itself was still in a clean room at the Lockheed Martin Space Systems plant in Littleton, Colorado, where it was built. Here in Tucson a young engineer, Lori Harrison, was attaching a set of instruments called TEGA, for Thermal Evolved Gas Analyzer, to a full-size engineering test version of the lander sitting on a simulated Martian landscape. Better to discover any glitches with the instruments' operation now instead of next year on the surface of Mars.

Smith showed me into a room equipped with computer consoles where data from

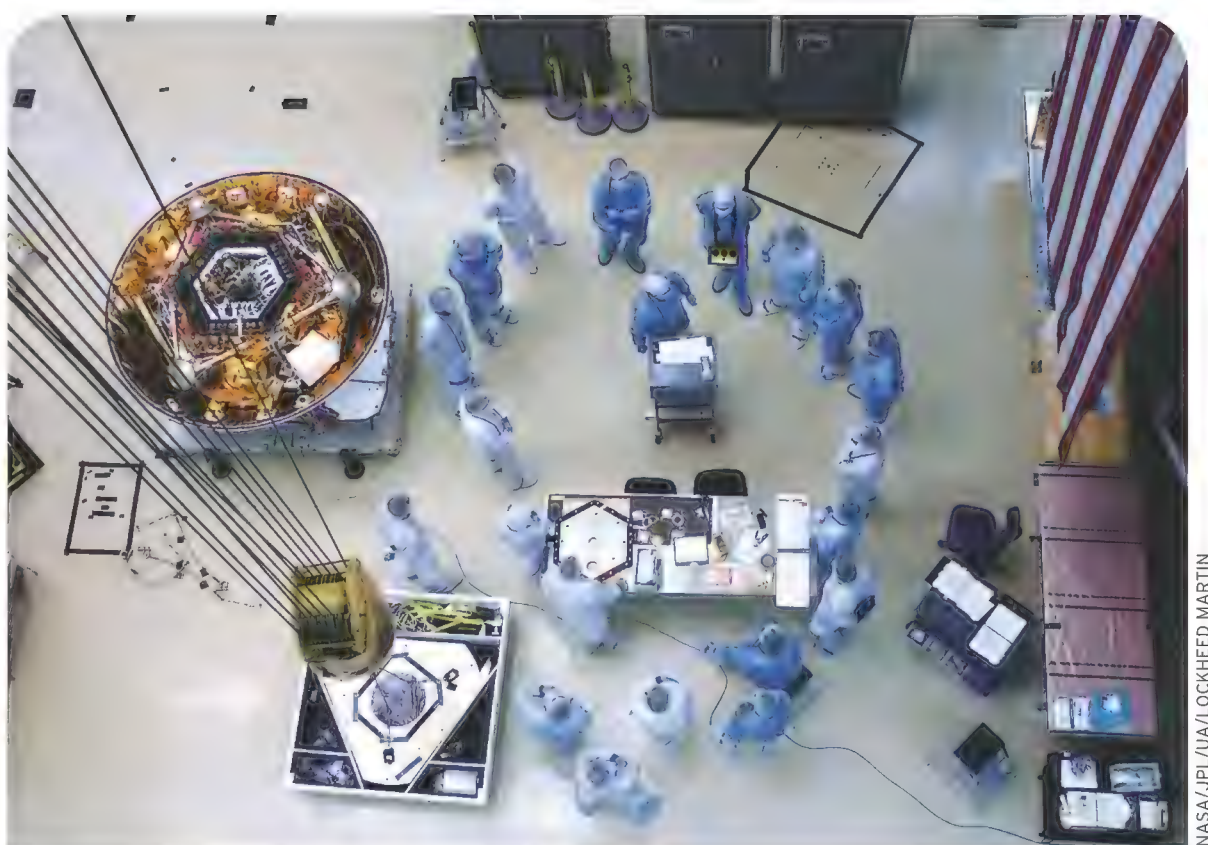
the mission will be analyzed. Spread on a large table were glossy photos, blown up to the size of hall carpets, showing the Phoenix team's first choice for a landing zone. They came courtesy of another NASA spacecraft, the Mars Reconnaissance Orbiter, whose most powerful camera, called HiRISE, was also built at the University of Arizona.

Smith is a Tucson native and has spent most of his career at this school, which has one of the best planetary science departments in the world. He led the team that built the camera for the Mars Pathfinder lander, which, with its little rover *Sojourner*, kicked off the modern era of Martian exploration in 1997. Since then Smith has had a hand in HiRISE and other Mars cameras developed at Arizona. He also was a co-investigator for the descent camera on the European Huygens probe, which in January 2005 returned broad panoramas of the surface of Saturn's haze-shrouded moon Titan (see "219 Minutes on Titan," Oct./Nov. 2005).

Not all his memories are happy. In 1999, Smith sat tensely watching monitors at JPL as the Mars Polar Lander, whose stereo lander camera his group had built, entered the atmosphere in preparation for a touchdown near the planet's south polar icecap. It was never heard from again. "We just sat and sat, and it got quieter and quieter," Smith recalled. Engineers later discovered a flaw in the spacecraft's software that shut off the craft's landing rocket, causing it to go into a free-fall high above the surface. Four years later, a British lander named *Beagle* also vanished on arrival—one of Smith's devices was on that one too. "Getting to Mars is difficult," he says slowly, leaning forward in his chair. "About 50 percent of the missions fail."

That's one reason the Phoenix team spent so much time scouting landing sites. The HiRISE pictures on the table show an essentially flat landscape with a pattern of cracks resembling polygons—in many places, polygons within polygons. It's the kind of terrain seen in Earth's polar permafrost, which is saturated with (frozen) water. Smith explained that the pattern, which repeats itself for thousands of miles at the northern latitudes where Phoenix will touch down, results from the expansion and contraction of ice.

There was something else in the pictures. Speckled on the polygons were ir-



At a Lockheed Martin plant near Denver, technicians ready Phoenix (upper left) for vacuum tests. The low-cost spacecraft was recycled from a mission that never flew.

regular blobs. They looked pretty, like pebbles with a bluish sheen. Those, Smith explained, were boulders. How big? He compared them to the size of SUVs, like the ones in the parking lot outside. The boulders weren't packed in; the density was more like a stadium parking lot an hour after the game ends. But there were still enough to pose a danger. "You land on one of those, it's over," Smith says.

That's why, after much discussion, the Phoenix team abandoned their first-choice landing site and looked in other places, including a region north of a collapsed volcano called Alba Patera, the broadest mountain on the planet. One promising site—the current top pick for a landing zone—was dubbed Green Valley because the computerized maps were coded by boulder density, and green has the fewest boulders. By comparing the detailed HiRISE images to wider-angle infrared images taken from another orbiter, the scientists found that rocky terrain appeared warmer in infrared images taken in the morning (a boulder's surface holds heat longer than sandy soil does). That helped speed up the process of scouting landing sites, since the infrared images cover larger areas of ground. The target landing zone is about 100 by 30 miles—the smallest footprint for which the scientists can accurately predict the spacecraft's aim.

The name Phoenix comes from the mythical bird that periodically dies in fire,

then arises reborn from the ashes. It's an appropriate metaphor for this mission, some of whose parts originated with another spacecraft that died before reaching its goal. Phoenix's Surface Stereoscopic Imager and the ovens for soil analysis are close copies of gadgets on the Mars Polar Lander, the spacecraft that crashed in 1999. The loss of that lander, which came during a nightmarish stretch of Mars program failures, led NASA to cancel another mission, the 2001 Mars Surveyor Lander, and stash its hardware, which had already been built, in a cold-storage clean room in Colorado. The basic structure of Phoenix, including its robotic arm, the camera on the arm, and the chemistry lab on the main deck, was recycled from the 2001 lander. That spacecraft was to have touched down near the equator in dusty soil. To accommodate the switch to hard permafrost, the Phoenix team put stronger bearings in the robotic arm joints, added the ice-cutting rasp, and beefed up the drive motors.

Thinking back to the failed 1999 mission, Smith is amazed at how close to the wire that project was run. "We literally did not have enough time in those days to track down the reason for every anomaly we might have found during testing," he says. Those were the days of "faster, better, cheaper," a speed-it-up, keep-it-cheap philosophy espoused by NASA's then-administrator Dan Goldin. The 1990s



NASA/JPL/JA/LOCKHEED MARTIN

Left: Clean room workers attend to instruments on Phoenix's science deck. The colored dots will be used to calibrate cameras on Mars. Below: Boulders seen in pictures taken from orbit made Phoenix scientists look for a new landing site.

also what the seasonality of Mars is and how that fits into long-term orbital cycles and climate change." That information, combined with remote sensing data from other spacecraft, could help scientists plan future Mars missions by suggesting regions where water is likely to have flowed in the past.

It hasn't been all smooth sailing since the NASA selection. The space agency has become more cost-conscious than ever, and if a Scout spacecraft can't be built properly within the approved budget, says Smith, it either gets scrapped or is scaled

saw a dramatic increase in the rate of space science missions, but even Goldin admitted later that he pushed the agency's workers and contractors too hard. When the low-cost Scout program was proposed, NASA agreed that the scope of the missions would also be scaled back; scientists and engineers wouldn't be forced to do more with less.

Phoenix originated with a phone call in early 2002. Chris McKay, a planetary scientist at NASA's Ames Research Center in California, called Smith to say, "Hey, let's do something with the Surveyor lander." NASA was inviting ideas for the first Scout, due to fly in 2007, and McKay and some of his colleagues at Ames had already been studying, with NASA money, ways to take the hardware from the canceled mission out of storage. "The word on the street was that headquarters would never let the 2001 lander fly," McKay recalls. "Not just 'No' but 'Hell no.'"

So, as a way to keep costs down, the scientists adapted the unused lander for their Scout proposal, with the idea that they'd use the equipment to do a detailed analysis of some patch of Martian soil. There was one small problem. "We didn't know where to go," Smith says. "We'd have a shovel, a bunch of instruments, and a pretty good general-purpose lab. We just didn't know where to land it."

Like an answer to a prayer, another NASA mission provided a solution. The Mars Odyssey entered orbit around Mars just as the space agency was getting ready to decide which Scout mission proposals to fund for further study. Measurements of hydrogen by Odyssey's gamma-ray spectrometer strongly suggested that at both polar regions, shallow ice exists at or near the surface. Planners would select a launch



NASA/JPL/JA

window for the 2007 mission that would enable the craft to land on Mars during northern spring and summer, when the days would be longest. And because it included instruments from the 2001 spacecraft, Phoenix would have more capabilities than the 1999 lander, and be more economical. Smith, in essence, was asking for a second chance at the mission that broke his heart.

In August 2003, NASA selected Phoenix as its inaugural Scout mission. Smith's proposal beat two dozen others, including one that would have returned samples of the Martian atmosphere to Earth. Mike Meyer, the senior scientist for NASA's Mars exploration program, is all in favor of resurrecting the goals of an approved but never-realized mission: "Mars Polar Lander was built for a very good reason, and Phoenix recaptures many of its advantages," he says. "It should give us a very good idea what that ice is made of, and

back to match the available funds. Despite the team's best efforts, it ran its budget dry. Into the discard heap went a radio transmitter, called the X-band antenna, which would have enabled Phoenix to transmit data directly to Earth. Now the only means of communication will be through the two spacecraft already circling the planet, the Mars Odyssey and the Mars Reconnaissance Orbiter, which will act as relays. The 1999 failures taught NASA one important lesson, however. Phoenix will continue transmitting data and reports on its condition all the way from atmospheric entry to touchdown. If something goes wrong during descent, mission managers will at least know what happened. Losing a spacecraft is bad enough, says Smith; never finding out why "is just horrible."

Late last year the project team let NASA know it was having money trouble. The biggest headache had been the landing radar, or altimeter. The original unit was inherited from the stored 2001 lander. Adapted from an altimeter used on F-16 fighters, "it was old when they put it in," Smith says. "The Air Force doesn't use this one anymore. We couldn't even get parts, and the guys who knew it best had retired." Tests revealed its performance was erratic, making data dropouts at critical times possible. The engineers spent months,

with Lockheed doing much of the work, making a reliable altimeter.

The project's budget had included a reserve fund for just these kinds of unexpected problems. Even so, the extra altimeter work, combined with fixes for other glitches and the late scramble to find a safe landing zone, put Phoenix tens of millions of dollars over the \$386 million cap NASA had set for the mission. The team had been warned that a cost overrun would set off a formal NASA termination review. One was held in late January. After Phoenix passed, Smith said it had been unlikely all along that NASA would actually cancel a mission so close to launch. But he did tell a *Rocky Mountain News* reporter that watching the bills run up had kept him in agony for months.

Even with the overrun, if Phoenix continues the Mars program's current string of successes, NASA will likely consider its money well spent. Since the 1999 loss of the Mars Polar Lander, the news has been all good: Mars Odyssey (launched in 2001 to further the study of Martian geology and weather), the twin rovers, and the Mars Reconnaissance Orbiter (launched in 2005) all arrived safe and sound, and all four are still working. The orbiters are busily mapping the composition of the atmosphere and the surface, as well as using ground-penetrating radar to explore the subsurface. The Mars Express, a European orbiter with a suite of powerful cameras and other sensors, has performed flawlessly. The *Spirit* and *Opportunity* rovers have delighted their operators by running well into their third year and traveling a combined total of more than 11 miles.

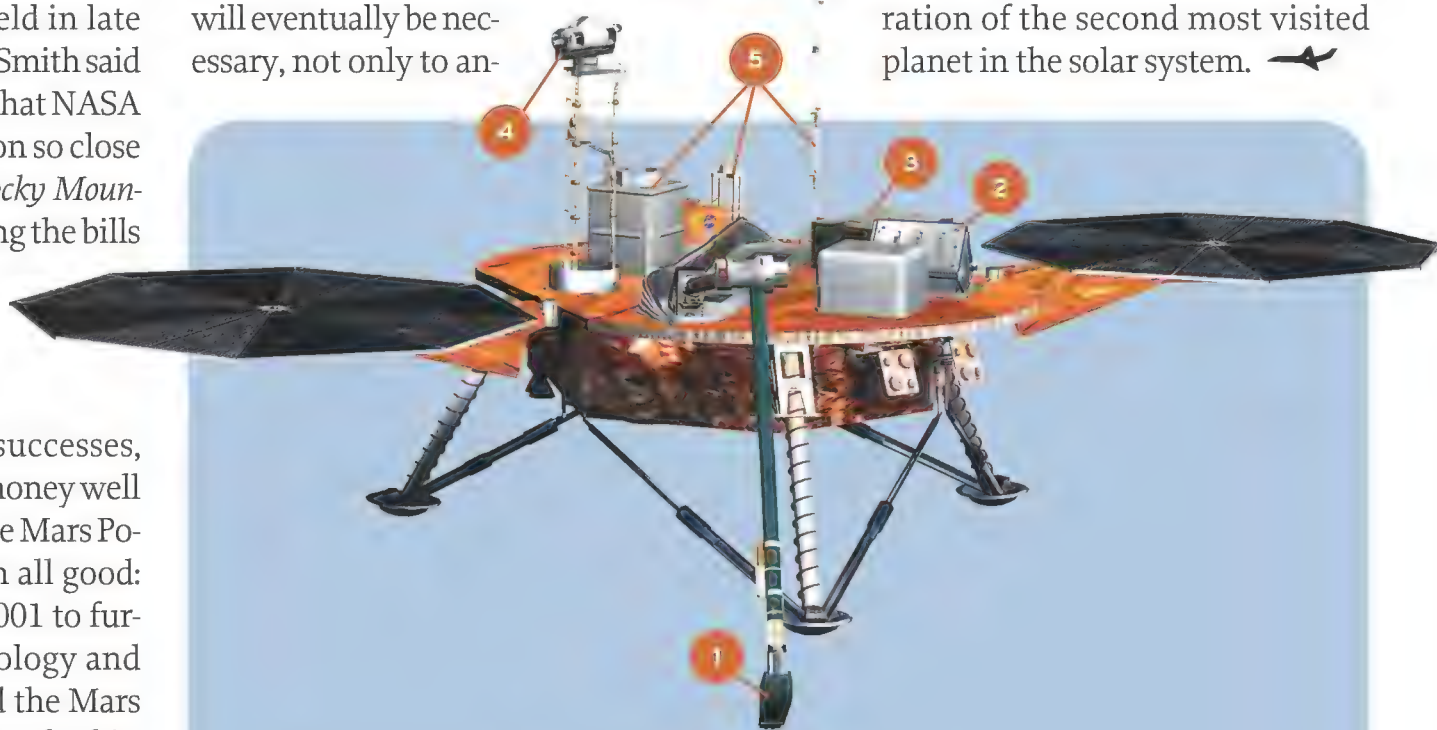
If Phoenix does find traces of organic materials and conditions suitable for life, or if it just helps scientists understand how water cycles between the ground and the atmosphere, it will shape the scientific questions to be answered by subsequent Mars missions. Favorable launch windows (meaning those that require the least amount of rocket fuel to reach the planet) come around every 26 months, and NASA tries to hit every window. Next up after Phoenix is a long-range rover called the Mars Science Laboratory, which in 2009 will carry an even more advanced organic chemistry lab to extend the search

for life. Another Scout mission, still to be selected, is slated for the following opportunity, in 2011. Beyond that, things become uncertain. NASA's Mars program has gotten leaner in recent years as the agency has shifted money from space science into preparations to send astronauts back to the moon. A Mars sample-return mission, once the program's highest priority, has been pushed off into an indefinite future.

Most scientists believe such a mission will eventually be necessary, not only to an-

swer questions about the possibility of Martian life but to help engineers prepare for an astronaut landing. There is some evidence that the soil may be toxic or corrosive, and NASA would want to carefully analyze it before designing spacesuits and other equipment for human explorers.

Until then, look for more Scouts like Phoenix to fill the gaps between the big, expensive missions and to pioneer a new approach to the continuing exploration of the second most visited planet in the solar system. ➔



Land, Look, Dig, Cook

- 1 A ROBOTIC ARM** built by the Jet Propulsion Lab, with a camera from the University of Arizona and the Max Planck Institute in Germany. The arm will dig and scrape up soil and ice to be analyzed by instruments on Phoenix's science deck.
- 2 An instrumented oven called TEGA**, for Thermal Evolved Gas Analyzer, built by the University of Arizona and the University of Texas in Dallas. Samples collected by the arm will be dropped into eight small ovens and heated so that a mass spectrometer can identify the molecules that boil off. Researchers will be on the lookout for complex organic molecules of possible biological origin.
- 3 A deluxe chemistry lab called MECA** (Microscopy, Electrochemistry and Conductivity Analyzer), a joint project of the University of Arizona, JPL, and the University of Neuchatel in Switzerland. MECA will wet the soil, then check its acidity, salinity, and other properties – clues to whether microbes could have survived at the Phoenix landing site. A microscope will peer at mineral grains to help determine their origin, while a soil probe measures conductivity.
- 4 The main camera, or SURFACE STEREOSCOPIC IMAGER**, built by the University of Arizona. The mast-mounted camera will survey the surrounding terrain to provide geological context, monitor atmospheric clouds and dust, and support digging operations.
- 5 A METEOROLOGICAL STATION** supplied by the Canadian Space Agency, with contributions from Finland and Denmark. Pressure and temperature sensors will keep track of the weather, while a laser ranging instrument pointed at the sky will distinguish ice particles from dust in the atmosphere.

Not pictured: A Mars Descent Imager (**MARDI**) camera built by Malin Space Science Systems of San Diego. Located underneath the spacecraft, MARDI will take detailed pictures of the landing zone just before touchdown so mission operators can determine where Phoenix has come down, and what's nearby.

An Airplane *in* Every Barn

A ONCE-
THRIVING
ORGANIZATION
OF RURAL
PILOTS IS
STRUGGLING TO
SURVIVE.



Rural aviation, now and then:
A Cessna 182 at a Flying
Farmers gathering in California
(above); an airplane-dependent
Colorado ranch profiled in a
1952 *Look* magazine article.

BY GILES LAMBERTSON



ALL COLOR PHOTOGRAPHS: PETER ALBIEZ; BLACK & WHITE PHOTOGRAPHS: LIBRARY OF CONGRESS PRINTS AND PHOTOGRAPHS DIVISION/LOOK MAGAZINE PHOTOGRAPH COLLECTION

“Did you see me land...both times?” said Eugene Shore, grinning sheepishly. The 70-year-old farmer had lightly bounced his Cessna 206 as it touched down on the Kansas grass airstrip of longtime friend Jack Jenkinson. Wearing jeans and a jacket and carrying a cooler, Shore climbed from the airplane and ambled to an open hangar where chairs and tables were set for 75.

Over the next hour or so, 20 more single-engine aircraft followed. Directed to the east-west runway by a bulging windsock, the aircraft swept in one after another and rolled to a stop on blue grama-buffalo grass. Each pilot carried a dish for the upcoming lunch.

Jenkinson’s farm is 12 miles from the town of Meade and just beyond the reach of gravel roads. From the air, the farmstead’s crosshatch of runways is clear, a target for pilots headed for this International Flying Farmers Kansas Chapter fly-in.

The fly-in is a Flying Farmers tradition that dates back decades, and one of the few activities that the organization is still able to sustain. Today, the Flying Farmers is a modest operation, but at its peak, the group offered not just member services and perks but lobbying on national issues affecting rural pilots.

Jenkinson and his wife Della are first-generation Flying Farmers, and the family also has a love of machinery in general, which seems to be characteristic of Flying Farmers. At the fly-in, just about every type of motorized vehicle could be found between the cedar and Austree windbreaks that protect the Jenkinson farmstead from plains winds.

Before his first guest arrived, Jenkinson towed his Cessna 172 and 170 from the hangar. Grandson Dusty Giessel zipped around on a Suzuki 50 motorbike near his grandpar-



The Look article portrayed the aerial operations of Mr. and Mrs. Charles Boyd, the latter a Flying Farmer State Queen.

ents' Honda Goldwing motorcycle. At one point Jenkinson scooped up dirt with a Ford tractor and dumped it in a cart hooked to a Honda ATV. Then, with a cap clamped on his head of white hair and an orange insulated vest zipped against a morning breeze that had tumbleweeds rolling, he raced down the runway. Standing on the three-wheeler's footrests, Jenkinson scanned the runway for badger holes to fill.

"Some people grow up," he said good-naturedly about his menagerie of machines, "and some people just grow old."

GROWING OLD is the Flying Farmers' urgent problem. The average age of a member in 1947 was 37; today it is approaching twice that. Twenty-six years ago, then-president DeLane Fry warned against complacency about recruiting younger members. "Continued membership is the lifeblood of any organization," the Oregon dairyman wrote in 1981, "and certainly International Flying Farmers will eventually perish unless we each do our part."

Four years earlier, International Flying Farmer membership had reached its peak: 11,000. Today it is 1,400, and no members are in the growth sector of "corporate farming," according to Kathy Marsh of the Flying Farmers headquarters in Wichita, Kansas. Some attribute the membership decline to the crisis in general aviation liability insurance that in the late 1980s

forced Cessna to discontinue production of small aircraft for several years. Others blame the dwindling of the farm population. Simply put, farms today are fewer and bigger than they used to be, and they are more often run as industries than as family businesses. Flying Farmers was conceived in an era that was very different for both farmers and pilots.

The group began in 1944, on the campus of Oklahoma A&M University, as a state organization; it went national the next year. (The addition of Canadian chapters made the organization "International" in 1961.) A survey conducted in 1948 estimated that 20,000 U.S. farmers and ranchers were flying.

The headquarters building was erected in 1953, near the control tower at Wi-

chita's Mid-Continent Airport. A second story was added in 1969, when the organization was still expanding. But in the 20 years she has worked there, Marsh mostly has known cutbacks. Though a couple of aviation-related firms have offices in the building, Marsh is now the sole staff member in the Flying Farmers office suite.

Across adjacent taxiways from Marsh's office is a maintenance facility for Cessna Citations; on the edge of the airport sits a Cessna manufacturing plant. Yingling Aviation sells Cessnas next door. The working relationship of Cessna and Flying Farmers is similarly close: Cessna regional sales manager Bruce Keller, an irrepressible booster of the organization, crowns the International Flying Farmers Queen each year in the name of company founder Clyde Cessna, "the first flying farmer."

In the late 1920s, Wichita was already home to Cessna and 28 other young airplane companies. By the 1940s, the city had attracted such general aviation companies as Beech and Mooney and had begun to bill itself as the Air Capital of the World. These and other Kansas manufacturers—plus airplane-makers farther east, including Piper in Pennsylvania and Aeronca in Ohio—focused on the farm market. A *Saturday Evening Post* writer noted that in 1947, nearly three-quarters of the single-engine airplanes built that year had been snapped up by farmers.

In the 1940s and '50s, the organization's *National Flying Farmer* magazine had full-



page advertisements by aircraft manufacturers touting the relationship of farming and flying. Luscombe called its Silvaire Sedan "the plane designed by farmers for farmers." Stinson bragged that its Flying Station Wagon was "a personal plane specially built to meet the thousand-and-one needs of farmers and ranchers." The Ryan Navion was introduced as "the plane you said you wanted." Classified pages were stuffed with deals on Ercoupes and Fairchilds, Swifts and Taylorcrafts.

Airplanes rolled easily into farmers' implement sheds. Chicago's 1948 National Farm Show dedicated a full quarter of its floor space to a display of single-engine aircraft. In April 1949, Senator Elmer Thomas of Oklahoma noted in the *Congressional Record* that the farmer was accepting the airplane faster than he had the tractor "as a new farm implement necessary to his operations."

In the early years of rural aviation, farmers used airplanes to hunt coyotes, disperse crows, spray sheep for pests, even keep air moving across orchards to fight off frost. They also developed uses for the airplane that are still valued today, such as the sort of look-down flights that favor high-wing aircraft—checking irrigation systems, photographing crops, and monitoring herds. Bill Valburg of South Dako-



Modern farmer saves time and money using Stinson Flying Station Wagon to bring in supplies and equipment, and to check crops, erosion, fences and livestock.

Here's a personal "cargo" plane—for farmers... the new STINSON "Flying Station Wagon"

HERE'S a personal plane specially built to meet the thousand-and-one needs of farmers and ranchers.

It's the popular new 21st Anniversary Stinson Flying Station Wagon—a husky personal "cargo" plane with all the comfort features, dependability, and inherent stability of the luxurious 4-place Stinson Voyager.

And, like the famed Voyager, it becomes a comfortable 4-place plane when the two rear seats are installed.

With its useful load of 935 lbs., this "fly-anywhere" plane can get in and out of small fields and even pastures with ease. Flaps for quick take-offs, and slow, short landings. Built-in wing slots for safety. Inherently spin-resistant.

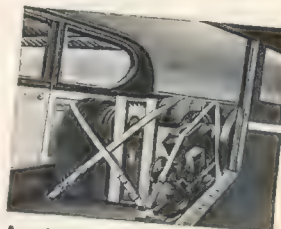
Cruising speed, 125 m.p.h. Take-off run, only 390 ft. Rate of climb, 753

f.p.m. Service ceiling, 15,650 ft. Stops in 290 ft. after landing.

Two-way radio, with dome loudspeaker. Starter, hydraulic brakes, soundproofed cabin, and many other de luxe features.

Fly the new Stinson Flying Station Wagon. It is actually saving money as well as time for many modern farmers.

Write for free brochure to Stinson Division, Consolidated Vultee Aircraft Corporation, Dept. O, Wayne, Michigan.



America's most USEFUL plane! Reinforced cargo compartment (24 cu. ft.) in 2-tone plywood paneling, equipped with sturdy tie-down straps. Side-loading baggage compartment offers an additional 11 cu. ft. of carrying space. Load capacity: pilot and 552 cargo pounds, or pilot, 1 passenger and 382 cargo pounds. Two rear seats replaceable in 5 minutes' time to make it a comfortable 4-place personal plane.

Stinson

FOR 21 YEARS—AMERICA'S
MOST USEFUL PERSONAL PLANE



Fly-ins reward attendees with good companionship as well as the occasional prized vintage aircraft. Left: At a Flying Farmers event he hosted in his Galt, California hangar, Dick Bjelland displays his P-51 Mustang, while an Oakdale, California gathering (above) is graced by a Grumman Albatross amphibian that dwarfs a nearby Cessna 310 (right).



The late 1940s and '50s was the golden age for the nascent Flying Farmers. Debuting in 1947 and touted as "America's No. 1 Utility Plane," the Stinson 108 Flying Station Wagon was marketed in a special ad campaign targeting farmers (top). Above: The Boyd ranch hosts a gathering for fellow Flying Farmers.



The Boyd ranch found aircraft indispensable (above and right), as did the ranchers and farmers the family welcomed during a fly-in (below). Bottom: California chapter members greet pilots at the World AG Expo in Tulare, California, the largest U.S. farm show.



ta, for example, flies a Skylane around his 5,600-acre ranch to watch over his Black Angus cattle. He also short-hops his Piper Super Cub to the mailbox, four miles from his house.

Over the years, farmers have found all sorts of ways to merge aviation with farm life. When dairy farmer Curtis Phillips of Beaver Crossing, Nebraska, became a pilot at 45, he turned a 600-gallon stainless steel milk container into a tank for aviation fuel and used his Cessna Skyhawk "just like a pickup." Lebanon, New Jersey dairyman Ryman Herr, 80, kept his Cessna 172 tied down in the open next to a 2,600-foot-long runway that gently rolls across the top of a hill on his 206-acre dairy farm. "When you're in Humpty Dumpty terrain," he says, "you have to make do with what you have."

(Fortunately for farmers, sturdier landing gear struts are not required for single-engine aircraft touching down on unpaved runways, "Humpty Dumpty" or otherwise. Standard gear is fine for grass or paved surfaces, Cessna's Bruce Keller

says, with the exception of truly primitive landing sites, which require oversized wheels and tires. Nor does

parking an airplane in the open automatically render it less airworthy, though Keller cringes when he sees airplanes parked outside and cautions that avionics can degrade more quickly when unsheltered.)

In New Jersey, truck farmers, dairy operators, poultry farmers, and cattlemen formed the first East Coast chapter of Flying Farmers in 1946. When West first met East at Flying Farmer conventions, George Conard of Flemington, New Jersey, recalls that prairie farmers would “look at us funny as if to say, ‘Well, are you *real* farmers?’”

The learning went both ways. Conard’s wife Judy enjoyed meeting people at conventions who had less “liberal” views than typical of the East Coast. “When you’re with people from the Midwest,” she says, “their whole attitude about life, about family, is totally different. It is really good to have that experience; it is very broadening. You learn you don’t have the answers for everything. Maybe you don’t have the answers for anything.”

Because many farm wives had been operating machinery alongside their husbands, sharing cockpit controls was a natural extension of the partnership. A pioneering early president of Flying Farmers, Forrest Watson, argued in a 1948

magazine editorial, “[I]n this association, women have their greatest chance to become an important segment of American aviation.... They need only make up their minds to become the equal of men in this game called flying.” While it would be another 50 years before a woman presided, female members familiar with agriculture and aviation issues were crowned queens and sent around the country to serve as ambassadors for the organization.

From the start, the organization focused on family. A “Landit” program encouraged both spouses to become familiar with cockpit controls in case the pilot was incapacitated. A teenage auxiliary formed. Scholarship programs enticed boys and girls to earn pilot licenses. No wonder airplane salesmen flocked to family farms.

In addition to addressing family issues, the organization energetically lobbied for cheaper airplane insurance, lower aviation fuel taxes, more local airports, better pilot training, and increased flying education. Today, public advocacy is only an incidental benefit Flying Farmer members get for their \$70 annual dues.

George Conard, who served a one-year term as the organization’s president, cites the Experimental Aircraft Association, formed in 1953, as a smarter organization: “We let them take the ideas that we started,” Conard says of the EAA. That organization took up the causes of insurance, taxes, airports, and education, aggressively broadened its appeal beyond owners of homebuilt aircraft and never looked back. Today, EAA membership is 170,000.

Perhaps the most striking example of a pilot with memberships in both the EAA and Flying Farmers is Brian Strizki, who flies two distinctly different airplanes: an Aeronca Chief and a Van’s RV8, an experimental two-seat kitplane. Strizki is a New Jersey State Transportation Department engineer who first

flew from a strip on his father’s tree farm. He eventually became New Jersey chapter president and then secretary of the international organization. But he resigned after his appeal for new vision went nowhere. He says he wanted to reinvigorate the organization without sacrificing Flying Farmers’ emphasis on family. “I think Flying Farmers needs stuff to attract more young people,” Strizki says. “More flying and less royalty.”

Such change is not apt to occur, Conard suggests. “The organization has come to the point that it accepts the decline as inevitable.”

IN 1994, FLYING FARMERS finally changed its bylaws and began to admit non-farmers. The change has not slowed the membership decline.

“The romance of flying is gone,” says former Flying Farmers president Willis Wollmann. Wollmann still flies his Cessna Skylane to check the harvests on his farmland near Moundridge, Kansas, but he sees an era fading: “Most flying farmers no longer fly,” he says. “A lot of them have traded their airplane for a recreational vehicle.”

Back in Kansas, Jack Jenkinson—who this year is treasurer of International Flying Farmers—says he believes improvement in economic conditions is the key to the organization’s survival. He has seen too many struggling farmers sell their airplanes to pay off a bank note and never return to flying. Slouched in the driver’s seat of a 16-passenger bus he sometimes uses to shuttle pilots at fly-ins, Jenkinson sounded almost wistful. “I hope I don’t have to sell my airplane,” he said. “I told my wife I would rather sell the farm, but when it comes right down to it...”

He sat up straight to make a point. “Our biggest problem is that we don’t get the word out that we have so much fun!”

Flying Farmers fun has included flights to Mexico, convention gatherings at locations across North America, tours of military installations and national parks, and, of course, fly-ins. Retired Kinsley, Kansas farmer Charles Schmitt and his wife Clara have loved every minute of it. “Those were the best years of our lives,” Schmitt said as the luncheon in Jenkinson’s hangar ended. “I said as a kid that if I could fly an airplane—or farm—I’d be happy, and I got to do both.”



COURTESY BILL VALBURG

Bill Valburg and his Super Cub. The South Dakota rancher flies to check his cattle, fix fences, and get the mail.

MAGIC AIRPORT

WATCH THE BURNING
MAN REVELERS PULL
AN AIRPORT OUT OF
THE DESERT...THEN
MAKE IT DISAPPEAR.



**STORY AND
PHOTOGRAPHS
BY CHAD
SLATTERY**



B

EFORE 9 A.M. IN NEVADA'S BLACK ROCK DESERT

the temperature is already 92 degrees, and Tom Fabrizio, a 747 pilot shouldering a tank of Turf Trax Blue, is at work. He slowly sprays the water-soluble colorant to outline a rectangle about 1,800 feet long by 600 feet

wide on the ancient lakebed's cracked surface.

"I'm making the tie-down area," he says. "With any luck this'll all be gone in three weeks."

Fabrizio is part of a small crew that brings into being Black Rock City Airport, born every August on this chunk of fractured desert floor 90 miles north of Reno. The airport is active for two weeks—the Federal Aviation Administration periodically observes its annual, temporary use—and then, as a condition of its existence, is erased.

BRC, its informal designator, is aviation's wormhole into the Burning Man arts festival, which started in 1986, when two friends burned a sculpture in a bonfire on a San Francisco beach and attracted a crowd. The bonfire has grown into an annual weeklong celebration, and the crowd has grown to 40,000.

Burning Man is performance art on an unimaginable scale, ritualistic and cinematic, especially if first viewed from a distance through desert heat waves. Slowly, Black Rock City materializes: massive sculptures, towering flames, mutated vehicles, and costumed revelers wandering across five

miles of tents and art installations, arrayed in a two-thirds circle. The soundtrack is 24/7 techno rave. The premise is radical self-expression. And the trick is to make it all vanish when the party ends on Labor Day, achieved mainly by burning everything flammable the night before. Participants bring all they need for the week, from food to tents to bikes, because nothing is available in the desert except portable toilets.

Burning Man migrated to Black Rock in 1990, and pilots immediately began flying in, drawn to the stretch of hard clay surface, known as playa, scrubbed smooth each spring by wind and rain. "We have a 400-square-mile airport here,"

observes Roger Ryan, owner of a wildly painted 1956 Piper Apache and known at the airport as "DragonFly!"

The lakebed's 27-mile length is the only break that aviators get. It sits nearly 4,000 feet above sea level; when triple-digit temperatures heat the thin air, lift diminishes as density altitude—the effective operating altitude, taking

Even when scalewags shuffle airport letters, it's hard to miss the spirit on the empty Nevada desert where the Burning Man arts festival happens. An Antonov An-2 (below) found its way for a stay of several nights.





Top to bottom: Tom Fabrizio marks the tie-down area with a biodegradable dye that fades in sunlight. From where Joanna and Daniel Langmade's Caravan 208 is tied down, the tent town of Black Rock City is just a bike ride away. Not exactly Chicago-O'Hare, the temporary airport at the festival is run by an all-volunteer staff—usually costumed—who collect fees, hand out safety guidelines, and welcome newcomers. Far right: At Burning Man, shorts and combat boots go together like sun and sand, and signage is both celebratory—a Skybolt kitplane painted on a tent—and cautionary (opposite, above).



temperature and air pressure into account—increases. The featureless desert floor reduces pilots' depth perception during landings. Winds constantly batter the aircraft, injecting fine alkali dust into every unprotected vent and inlet.

Capricious playa weather further complicates flying. Past Burning Man events have experienced hail, 70-mph winds, drenching rain, 120-degree heat, and zero-visibility dust-devil curtains blowing across the runway. "Storms are sudden and violent," warns one aviation Web site, "and hospitals are far away."

Despite the difficulties—or because of them—123 aircraft flew into Burning Man last year. Two stood out: a customized Antonov An-2 ("Beats an Airstream," quipped owner Douglas Fulton), and the first private jet to ever land at the festival. The Cessna 525 CitationJet's arrival set off fierce speculation about damage to the engine cores as they ingested the pervasive dust. Owner Don Morris shrugged off concerns:

"It's a machine. What are you going to do? You can park it forever if you don't want it to wear out." (Eight months later, he reported that the jet was doing fine.)

In aviation, a conservative enterprise, iconoclasts like Morris are the exception; at Burning Man, they are the rule. Ramona Cox, a 1,800-hour pilot, packs her Cessna T206 with a six-person tent to hold her costumes. "I bring a Turbo Stationair," she says. "It's perfect. I can have 80 gallons full fuel and still haul a thousand pounds. That's a lot of costumes." Asked if the pilots here are different, she responds, "They're more adventurous, fun-loving, and non-judgmental. They're not afraid of landing off an airstrip, or putting their airplanes into the elements." Roger Ryan is more concise: "Coming here

is about upping the ante if you're a pilot. It's a harsh environment."

And a playful one. "Airports are usually very serious, with rules and searches and security," says volunteer Heidi Karl, dressed in a bright red tutu, "but here you can be silly and have fun." Incoming pilots and passengers are asked leeringly if they'd prefer to be patted down by a male or a female. Volunteer Bettina Kahlert laughs, "It's the only airport left where you can make jokes about bombs."

Or show up naked. Most of the 150 volunteers who staff the airport are dressed, and their self-expression often takes the form of fishnet body stockings, thongs, and imaginative interpretations of airline uniforms. The only taboo: feather boas and sequins, banned by the federal Bureau of Land Management for environmental reasons.

Like everything else in Brigadoon-like Black Rock City, the airport has evolved.

"The first time I flew



to Burning Man was in 1996,” recalls airport manager Lissa Shoun. “There was no airport, just 35 planes scattered across the desert, parked wherever they wanted to be. Cars were driving everywhere, running over tents and people in the dark, throwing dust everywhere.

“It was very interesting back in those days. I was told, ‘Use this frequency, and maybe a pilot on the ground will talk to you.’ A pilot answered; it took me about 10 minutes to find him on the ground. There was no city at that point. ‘Land in between the geodesic dome and the guys on the go-carts.’”

With encouragement from Burning Man staff, Shoun returned the next year determined to gather pilots and airplanes into one dedicated camp and establish the semblance of a fixed-base operator. “We found a stretch that was flat and level for the runway,” she remembers. “Then we stuck a windsock on an irrigation pole, pulled out some [hand-held radios], and put a parachute on a pole for shade. That was it. We had our FBO.”

In 1999 Shoun registered with the FAA but did not ask to be included in the

agency’s database. This year she will. The airport will be described as a temporary, VFR facility with Class G airspace. Translation: There’s no control tower to direct traffic. Pilots need the awareness required of all pilots operating under visual flight rules. As for the three-letter identifier, Shoun is hoping for “something cool,” like BRI or BRA.

Over the next few years, pilots added amenities that mimic airport facilities in what Burners call the “default” world. A fixed-base operator—vaguely defined but boldly designated the Black Rock Travel Agency—was cobbled together using an abandoned trailer (the galley), movable letters discarded by Reno’s municipal airport, and a sprawling tent (pilot’s lounge). Arriving pilots could receive information about the direction to land in from volunteers with hand-held radios over the same UNICOM frequency pilots use to announce themselves at small, uncontrolled airports anywhere in the country. Shoun organized work parties that rebuilt another trailer into a mobile office, complete with air conditioning. The newest addition, a modular terminal, was designed by Bryan Lang, who paid for it with \$15,000 of his own money.

Then, in 2003, two aircraft—both V-tail Bonanzas—crashed on successive days. One pilot died and four passengers were



A 1970 Cadillac named Cessna B. Deville shuttles arrivals to Black Rock City, while a crew raising a regulation windsock...



...strikes the Iwo Jima pose. Every pilot is a free spirit – some (below) freer than others.



hospitalized.

“That changed everything,” Ryan remembers. “Real fast, we had to either transform ourselves from a group of pilots in the desert into a real airport, or get shut down.”

Over the next year, Shoun, Ryan, and a cadre of experienced pilots hammered out procedures to increase the safety of operations, culminating in a dense 12-page airport operating plan. The test came during the 2004 event, when FAA inspectors showed up to observe the air operations.

What they found was a triple-tier information system designed to ensure that pilots fully understand traffic patterns, UNICOM radio procedures, and the difficulties of flying in high deserts during summer heat.

The first of the three tiers is the advisory information on the airport’s Web site (www.burningman.com/on_the_playa/airport/), designated “for Whiskey Breath.” “If arriving pilots say they have ‘Whiskey Breath’ when they radio their first position report, it means they’ve done their homework and know the pattern,” explains Ryan. “And I love making them say they have whiskey breath over the UNICOM.”

For the volunteers, Ryan wrote a 21-page Radio Operators’ Handbook. The second tier of safety, it provides a checklist of information to transmit to each pilot, including field elevation (3,905 feet) and wind conditions.

The runway is easy to spot from the air. The mile-long, 50-foot-wide strip was formed by a local contractor who was paid \$1,500 to scrape a thin layer of playa with a grader, a process that smoothed out small transient sand dunes and revealed the darker substrate just below the surface. “It’s a 5,000-foot runway with a 137,000-foot overrun,” jokes Ryan.

Once on the ground, first-time arrivals are directed to the tie-down area and asked to report to the terminal. Volunteer “customs officials” register the airplane, collect the tickets (\$350—cash only—at the gate; cheaper ones can be purchased in advance), and inform pilots that they will not be allowed to fly back out until receiving the mandatory safety briefing, the third tier of safety guidelines.

The briefings are held each morning at 8 a.m. in the large open tent that serves as a pilot’s lounge. All are delivered by air safety officers, Burning Man veterans with names like Tiger Tiger and Hoot. Halfway between a monologue and a lecture, they focus on landings (“This is a soft field, not a short field. Carry power in to your landings, keep the yoke in your lap and the nose high—the stall horn should be shrieking”), position reports (“Keep it simple. ‘Six o’clock to The Man, red and white Cessna, five thousand feet’ is all we need”) and reminders that the FAA may show up at any time (“Even if I knew in advance, I wouldn’t tell you. They’re friends to the airport”). Airplanes with low service ceilings are cautioned that heat can affect density altitude, severely degrading performance. Briefs conclude



Land ho! Pilot Ray Arceneaux (below) and his float-equipped Cessna 185. In the Pleistocene era...



...floats would have come in handy. Aircraft park on what was once a lake in the Great Western Basin.



From the air (opposite), tens of thousands of tents arranged in a two-thirds circle around "The Man" seem like the archaeological remnant of a past civilization. On the ground (right and below), Burners, as festival-goers are called, use all manner of conveyances not only for transportation but for self-expression.



with a warning for departing pilots: Although they are flying into uncontrolled airspace from an uncontrolled airport, they remain subject to the same laws of man and physics as anywhere else. That concluded, each is issued a colored wristband that permits unrestricted access to the airfield.

The airport's self-policing worked: Since the multi-layered safety structure was introduced, Black Rock City has had a perfect safety record.

The FAA is satisfied; the agency did not bother to send observers in 2006.

In recent years the airport began integrating itself with the larger festival. Burning Man operates as a gift economy, not a consumer event. There are no T-shirts-and-souvenirs tents and no food vendors; the only things available to buy are coffee and ice. Sight-seeing flights out are the pilot community's gift, and each day several dozen Burners make their way from the main encampment hoping for an aerial look at the city. A knowing few discreetly ask for a private mile-high flight in back of a four-seater; veteran Roger Plowe is happy to accommodate them and grins, "One is immediately impressed at how much kinetic energy can be transferred to a small aircraft during those flights."

"In 2005 I gave 77 rides to 75 people," says a compact, 50-ish pilot who goes by the single name Berk. "A lot of them said it was the highlight of their time here." Roger Ryan reflects, "Buddha says the true gift is the one that goes unheralded. We're all quiet about it. We don't need to tell them we just gave them a \$150 gift."

Whether pilots do it for fun or as a gift, flying at Black Rock City offers them the same freedom they enjoy back home. Burners arriving by land must park their vehicles; to mitigate dust and encourage interaction, only specially permitted art cars may drive on the playa. Aircraft, by contrast, are free to come and go at will. Last year, one couple flew their Cessna Caravan into nearby Winnemucca to buy cold beer and check

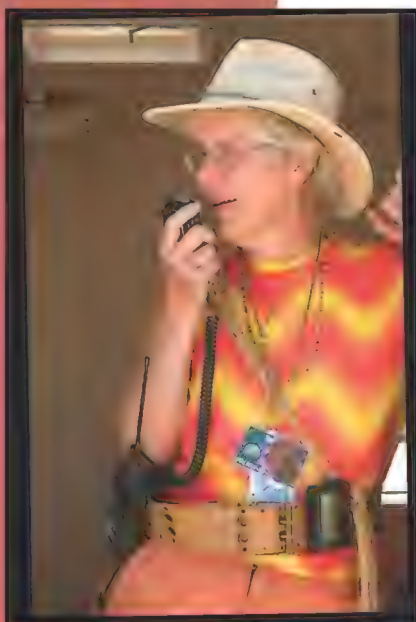
their Blackberries; pilots commonly fly to Reno to pick up friends at the airport. Ray Arce-neaux, whose float-equipped Cessna 185 drew double takes taxiing in, favors Alvord Hot Springs across the Oregon border: "I like to take the scantily clad ladies more than anything else. They have a way of convincing me that they really need an airplane ride."

In 2006 Black Rock City Airport began shutting down the day after Labor Day. "I was relieved," said Lissa Shoun. "There were no crashes, no near-misses, no troubles at all." For the next five days volunteers dismantled the terminal and scoured the playa for trash. At night they discussed plans for the 2007 airport. "We need more public art," Shoun decided, "and we want to train the volunteers better."

Then, on Sunday, she woke up early and took one last look around the deserted lakebed. Satisfied there was no more trash to pick up and nothing left to do, she hitched the office trailer to a van and drove off slowly, leaving nothing but dust in her wake. ➔



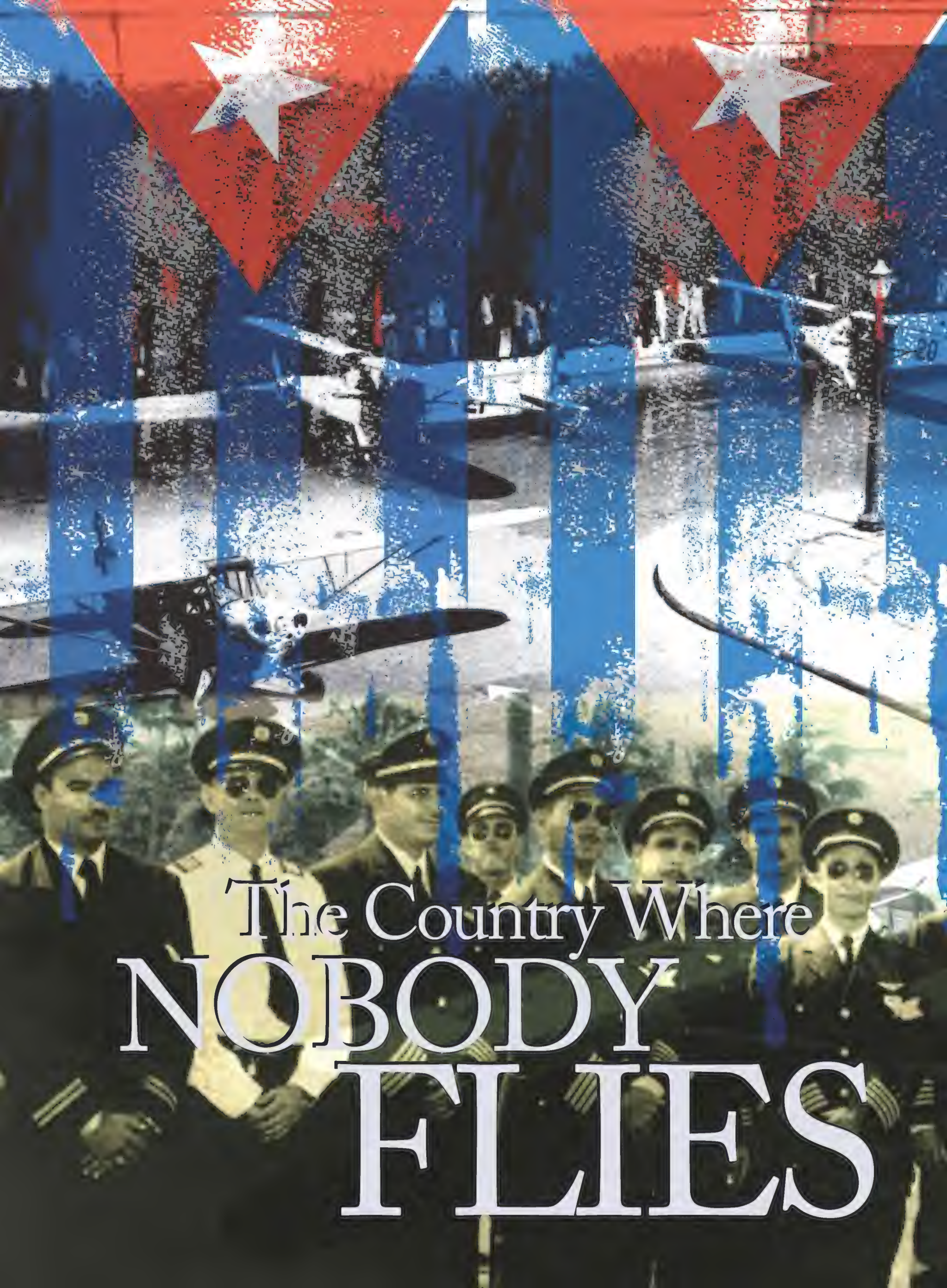
Lissa "Tiger Tiger" Shoun is the airport manager with a motto: Leave no trace.



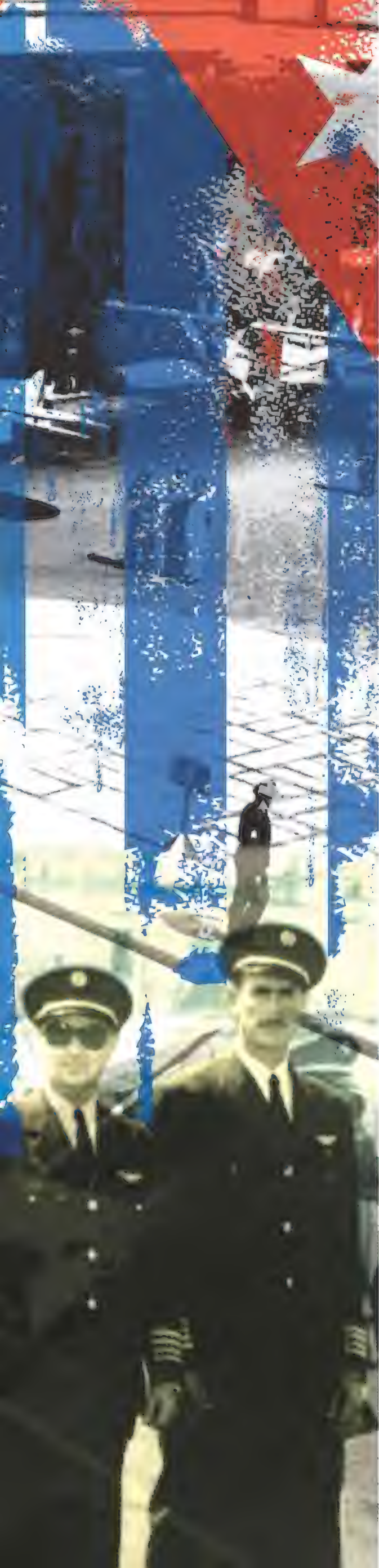
LISSA SHOUN

At the end of the week, Burners return the desert to empty.





The Country Where
**NOBODY
FLIES**



ON A BARREN LANDING STRIP in Agramonte, in central Cuba, a swayback horse nosed for scraps in the weeds. Off to one side, the decaying hulk of a Russian tractor—its wheels long gone—stood rooted in place by rust. In the distance, rows of green sugar cane waved in the breeze. On a 10-day journalist visa in 1999, I traveled to what had once been busy grass airfields and paved landing strips all around Cuba. In Agramonte, some 435 miles from Havana, I walked the length of the old runway, kicking at the grass and looking for tie-downs, landing lights—any hint that aircraft had ever landed here at all.

Almost 50 years before, on a warm fall day, I had stood on the edge of the same strip, holding my mother's hand as we watched a DC-3 float down for a landing on what was a lush, manicured grass field beside a *central*, or sugar mill. The cargo airplane gleamed in the heat waves as it settled. I was just four, but the image of that day was burned into my memory—the shiny silver fuselage, the *wisp-wisp* of the propellers slicing the air, and my mother's perfume mixing with the smell of the freshly mowed grass as she leaned down to tell me, "That's your uncle and father in that plane."

Ours is a family of pilots. All four of my mother's brothers were aviators. Two died in airplane crashes. The others were Cuban military pilots, as was my father. Born at a military hospital at Campo Columbia airfield near Havana, I still remember the lines painted on taxiways, the roar of the Allison engines in my father's P-38 Lightning, and the forest-green airstrips at places like Agramonte.

What none of us could have known on that day in September 1957 was how dramatically our lives—and aviation in Cuba—would soon change. For even as my father and uncle brought that DC-3 down for a landing, a powerful force was taking shape in the slate-blue mountains surrounding the field. There, guerrillas loyal to Fidel Castro were fighting to overthrow the regime of Fulgencio Batista, whose three decades in power had spanned the golden age of aviation in Cuba. Castro's forces would take control on New Year's Day 1959, and with their arrival began the chaotic, downward spiral of aviation that, in less than three years, would result in the grounding of virtually all private airplanes in Cuba.

Of course, other authoritarian regimes around the world—in the Middle East, in Africa, in Asia—have either tightly restricted private flying or banned it altogether. But Cuba is unique in that, for more than 40 years, it had a vibrant flying community. Three schools taught hundreds of Cubans how to fly. Numerous airstrips were laid down all over the island, usually near large sugar plantations. And because of Cuba's close relationship with the United States, a steady supply of private aircraft flew in, out, and around the island.

by Rafael Lima

Cubans had embraced aviation with a passion from the beginning, when in May 1910 a French aviator, Andre Belot, astonished Havana residents by flying his 60-horsepower Voisin biplane over a grassy plain in the city. Three years later, two Cuban pilots—Domingo Rosillo (with a naval escort) and then Agustin Parla (with only a compass)—made the 90-mile flight from Key West, Florida, to Cuba and were hailed as heroes. In 1919, the Compania Aerea Cubana set up the first flying school in Cuba, using Farman F-40s. The following year brought the first Cuban airline service and the first airmail flight. Charles Lindbergh stopped by on his goodwill tour of the Caribbean, landing the *Spir-*

Aviation once was such an important part of Cuban life that the country staged a parade in Havana (left) each spring to honor pilots and their airplanes. Before the revolution, many Cuban airline pilots trained in civilian flight schools; today they are all in the military.

DID CUBA ABANDON ITS PRIVATE PILOTS OR DID THEY ABANDON CUBA?

ALL PHOTOGRAPHS FROM THE COLLECTION OF JORGE L. RODRIGUEZ, EXCEPT WHERE NOTED

it of *St. Louis* in Havana on February 8, 1928.

In the 1940s, Benigno Diaz—now 96 and living in Miami—set an aviation record of a different sort: He put together Cuba's first homebuilt, assembled from plans in *Popular Mechanics*, with the help of a childhood friend, Roberto Gude. In 1938, Diaz and Gude used wood from fish crates and poplin from a fabric store to begin constructing the island's first experimental aircraft. "It took us years," Gude says. "We had to beg for every nut and bolt and piece of fabric and wood. Everything on that plane was improvised."

The landing gear was crafted from automobile exhaust pipes. One friend, a pilot, donated a 65-hp Con-

landed on public streets, then taxied parade-like down the capital's coastal boulevard, the Malecon. Hundreds of people lined the sea wall, and pilots would wave at the admiring crowds like princesses on May Day floats.

"It was wonderful, like a dream," recalls Diaz's daughter Alba. "The airplanes and the sea wall, the crowds of people. I remember someone lifting me up and into the little plane to sit on my father's lap. We taxied around the Malecon in the parade."

Luis Palacios, 67, who soloed in a Piper J-3 Cub when he was 19, remembers the heart-stopping landings the pilots had to make. "You had to land the plane directly on the street," he says. "Sometimes it was tricky

with the crosswinds coming off the water. The planes were mostly tail-draggers. Then all the planes would taxi the



At the Wings Over Miami museum, Benigno Diaz (above) holds a model of his homebuilt. Right: Diaz readies his airplane for takeoff from Havana in 1945.



Crowds line the shore in Mariel, Cuba on May 19, 1913 to welcome Agustin Parla, who soloed from Florida.



tinental engine and the tires off a Piper J-3 Cub. After seven years, the airplane dubbed *La Estrella Errante* (Wandering Star) was finished. Diaz's father was there for the 1945 maiden flight. He approached his son, put his arm around him, and said, "Benigno, are you sure you tightened all the bolts on that thing?" Diaz nodded. He climbed into the cockpit, turned the aircraft onto the grass field, and gave it power. Gaining speed, the little airplane bounced and lifted off. "It flew very well," says Diaz, who still has a small model of his handiwork. "It was the first flight of the first homemade plane on the island."

La Estrella Errante joined many other airplanes to take part in an annual celebration in Havana called The Day of the Aviator. The festival, which had begun in 1953, was held every May to commemorate the Florida-to-Cuba flights of Domingo Rosillo and Agustin Parla. As part of the festivities, private aircraft

length of the Malecon with people hanging onto the

wings, helping guide the plane through the crowds. It was spectacular. I've never seen anything like it anywhere else in the world."

Such bravado was typical for the pilots. In those days, private pilots in Cuba flew unencumbered by airspace regulations or control towers, says Palacios, who flew for Eastern Airlines after coming to the United States in 1961. "You could take off from one town, fly along the coast, and see a beach and land on it. Many pilots used to land on hard-packed sand beaches, have lunch or a swim, and get back in the plane and take off. Of course, if you do that today [in the United States], you have the FAA and the NTSB and ev-

everybody else on top of you in minutes.

"Some pilots never bothered with actually getting a license," Palacios says. "Somebody taught them the basics of flying and they just flew. There were no sectionals [charts], no radios, and no electrical systems. The planes were hand-propped, and it was basic stick-and-rudder flying. But many of those pilots without licenses were a bit reckless. There were times unlicensed pilots would fly under bridges or do barrel rolls over houses. I think there might have been an element of machismo at work there because it wasn't very safe."

Palacios' most vivid memories from that time were simply of the romance of flying in Cuba. "There was a fragrance," he says. "Not just a smell. It was a fragrance

base in Miami. Many pilots trained in flight schools in Miami, bought planes there, and flew them back to the island."

During the 1940s and '50s, more and more American pilots made the crossing to Havana; airports and grass fields all over Cuba were crowded with private airplanes. One travel brochure of the time had a drawing of a leather-helmeted pilot flying a small airplane from Florida. The headline read: "Just a 'plane' hop and you're in Cuba." Another, which read "For Private Pilots Only," had a goggled pilot playing the maracas with a comely *senorita*, her skirt billowing as she dances. The brochures offered an image of an exotic paradise



Two days before Parla's flight, Domingo Rosillo (above) used a naval escort to make the Key West-to-Cuba trip in a French Morane-Saulnier. Both men are hailed as Cuban aviation pioneers.

that would waft in through the open windows of those small planes. If you were flying into coffee fields or sugar cane fields and especially tobacco fields—it was wonderful." While some Cuban pilots flew for the sheer enjoyment, many others were training to become airline or cargo pilots. They wanted the glamorous position of airline captain, and they had several flight schools in Cuba to choose from—one in Havana, one in Santiago de Cuba, and the third, a floatplane school, on the Rio Almendares, Havana's main river.

SEVERAL FACTORS SPURRED the growth of general aviation on the island, chief among them Cuba's proximity to the United States. "In those days, Americans and Cubans traveled back and forth from Cuba and Miami the way we do now between Miami and Fort Lauderdale," Palacios says. "Cuba was only an hour or so away from the States by plane. There were all the flight schools in Miami. There was the Pan Am

of casinos, nightclubs, and dance halls, where rum flowed like water and women were always available. One flight school airplane sported an advertisement on the underside of its wings: "Drink Bacardi Rum."

But in January 1959, everything began to change. Within weeks of Castro taking over, a new guerrilla war broke out in the mountains of central Cuba, pitting "counter-revolutionaries" against the new government. Sensing danger, some Cuban and American pilots began flying their aircraft off the island. The first to leave were the professionals. "It was the upper and middle class that could afford the private planes that left Cuba right away: doctors, lawyers, bankers," says Jorge Rodriguez, editor and publisher of *On Cuban Wings*, a history of Cuban aviation.

But where some saw turmoil, others saw opportunity. Cuban expatriate pilots began flying their airplanes in from Miami to drop anti-Castro leaflets all over the island or bring guns and ammunition to the



Once the site of the Day of the Aviator parade in the 1950s, the Malecon today is a busy, four-mile-long boulevard that cuts through Old Havana. Its famous sea wall is popular with tourists and residents alike, and offers a romantic meeting place for lovers.

combes, Cessnas, and Pipers back to the States. Mobsters fled aboard Lodestars and DC-3s.

"Pilots were escaping with anything that flew," says Rodriguez. "Castro tried limiting the amount of fuel for private planes to try to keep them from having enough range to reach the U.S., but pilots still found gas and opportunities [to escape]."

Finally, in early 1961, the United States broke off diplomatic relations with Castro's government. Commercial flights between the two countries—including airmail—ceased. Airplanes, private and commercial, were being hijacked at gunpoint all over Cuba by pilots or passengers desperate to leave. At least 19 aircraft were hijacked from early 1959 to the spring of 1961, according to Rodriguez. Those who made it to the United States were officially welcomed and giv-

Airplanes, not automobiles, cruised the Malecon on parade day in 1953 to mark the 40th anniversary of Parla's historic flight.



counter-revolutionaries, just as Castro's forces had flown private airplanes against Batista's regime. Several anti-Castro exiles even flew impromptu sabotage missions, dropping homemade bombs from their Cessnas and Pipers. Though the missions had little effect, the flights angered the Cuban government, which promptly began grounding civilian airplanes. The Day of the Aviator parade was canceled. Orders were given to shoot down any unauthorized airplane in the skies over Cuba, and Castro—fearing an invasion was imminent—drew closer to the Soviet Union.

Throughout 1959 and 1960, Castro began nationalizing everything on the island, from banks and oil refineries to Cuba's airline, Cubana de Aviacion. As the split with the United States grew, the exodus of private aviation accelerated. Like flocks of migrating birds, airplanes quietly lifted off from grass fields and small airports all over the island. Cuban and American businessmen and tourists piloted Beechcrafts, Lus-

en asylum. "Anyone escaping Castro's Cuba was considered a political refugee," says Palacios, who flew away in his Cessna 310 that summer from Rancho Boyeros airfield near Havana.

I remember my own flight from Havana as a seven-year-old in early 1960. A friend of the family and an airline captain helped my mother and me get visas under assumed names. Like all departing Cubans, we were searched, and whatever personal items we carried were confiscated. As we waited in line to board the Aerolíneas Cubanas DC-3, our pilot friend put his arm around my mother's trembling shoulders, stuffed a forged ticket in her purse, and whispered: "*Los turistas no lloran*"—Tourists aren't supposed to cry.

Wearing green uniforms and carrying rifles, rebels with beards and shoulder-length hair watched the line of passengers, looking for counter-revolutionaries. If the people were just *turistas*, the thinking

went, they would not cry. If they cried, they were escaping. If they were escaping, they would be caught and jailed. After we were seated, my mother's arm tightened around my shoulder as the bearded men boarded the airplane and, after a few moments, pulled a middle-aged man in a starched white *guayaberra* from his seat. There was a nervous pleading in the man's eyes as he walked down the aisle, between the rebels. My mother could not stop trembling. A little less than an hour into the flight, the pilot came back to get me. He brought me forward to sit in the cockpit for the landing in Florida. As the DC-3 descended through a thunderstorm, past the blur of windshield wipers, I saw the coastline of Key West.

Cuban government rejected my repeated attempts to obtain a visa.)

After the failed April 1961 Bay of Pigs invasion, in which a CIA-backed force of about 1,500 armed Cuban exiles tried unsuccessfully to invade a beach in south-central Cuba, Castro aligned his government firmly with the Soviet Union and confiscated all remaining private airplanes. "With the Russians coming in right after the Bay of Pigs, everything became Soviet," says Rodriguez. Cuba's air force got new MiGs, while its domestic airline got old Antonov An-2s and Ilyushin Il-14s. Almost at once,

U.S.-built airplanes on the island were endangered: Spare parts were almost impossible to get, and without spare parts



Havana's aviation museum features a mix of aircraft, including Soviet-made fighters, small commercial transports and private airplanes. The museum also has on display the wings of an American U-2 spy plane downed by Soviet missiles in Cuba.

Once common, private aircraft today in Cuba are museum pieces, including this Cessna 310 used by Che Guevara to coordinate rebel activities in the revolution against Fulgencio Batista's government.



My mother, alone in the back of the plane, could finally cry without the fear of being seen either by the rebels or by me.

My father, Rafael Sr., and uncle, Luis Rojas, would join us later in Miami's Little Havana neighborhood. As pilots in Batista's air force, they were jailed as enemies of the state after Castro came to power. My father would spend a few weeks in prison before escaping with the help of a rebel soldier and the Brazilian Embassy. My uncle didn't fare as well; he spent 23 years in political prisons before making it to Miami, and is mentioned in Armando Vallderes' book *Against All Hope: A Memoir of Life in Castro's Gulag*. (My hopes of revisiting Cuba for this story were dashed when I learned earlier this year that a videotape of my documentary on Cuba's 1960s political prisoners had been smuggled into the country and viewed by a group of independent journalists at a clandestine meeting in Havana. The

an aircraft is practically useless. "The Cuban government sold some to Latin countries," says Rodriguez. "What planes had not been flown from the island were cannibalized and finally sold as scrap aluminum."

Perhaps the last private airplane out of Cuba was a single-seat Air Tractor that flew from Havana early in the morning of October 26, 1961, according to Rodriguez. A pilot and mechanic escaped in the airplane, which was fitted with cropdusting gear on the wing's trailing edge. As the pilot checked the ailerons, tires, and oil level, the mechanic found a comfortable position to lie on top of the wing. The pilot took a rope and looped it around the mechanic's wrists and waist, strapping him to the wing. The cropduster lifted off the grass field and into a rosy dawn. Some three hours and 40 minutes later, the aircraft and its hog-tied mechanic touched down to safety in Key West.

AT THE HEIGHT OF GENERAL AVIATION in Cuba, there might have been as many as a thousand private and student pilots on the island, Rodriguez says, and “probably hundreds of private planes, if not a thousand.” But since many logbooks and flight records stayed on the island, it is difficult to get an accurate number. In the end, any airplane that was not hijacked, used in anti-insurgency operations, or shot down was grounded—in most cases permanently—and seized as the property of the Cuban government.

“I would say it only took one, maybe two years to completely end general aviation in Cuba,” says Palacios. “The counter-insurgency, then the mass exodus of Cuban pilots, the Bay of

ed canvas were gone. The 10,000-acre sugar, tobacco, and coffee plantations that were the unofficial homes for private airplanes were portioned into small, peasant-farmed agricultural collectives. At Jose Marti airport in Havana, I saw no private airplanes, save the occasional European corporate

jet hissing to a gate, carrying a diplomat. The few American pilots were mostly with charters, although it is legal—with permission from both the U.S. and Cuban governments—to land private American aircraft in Cuba.

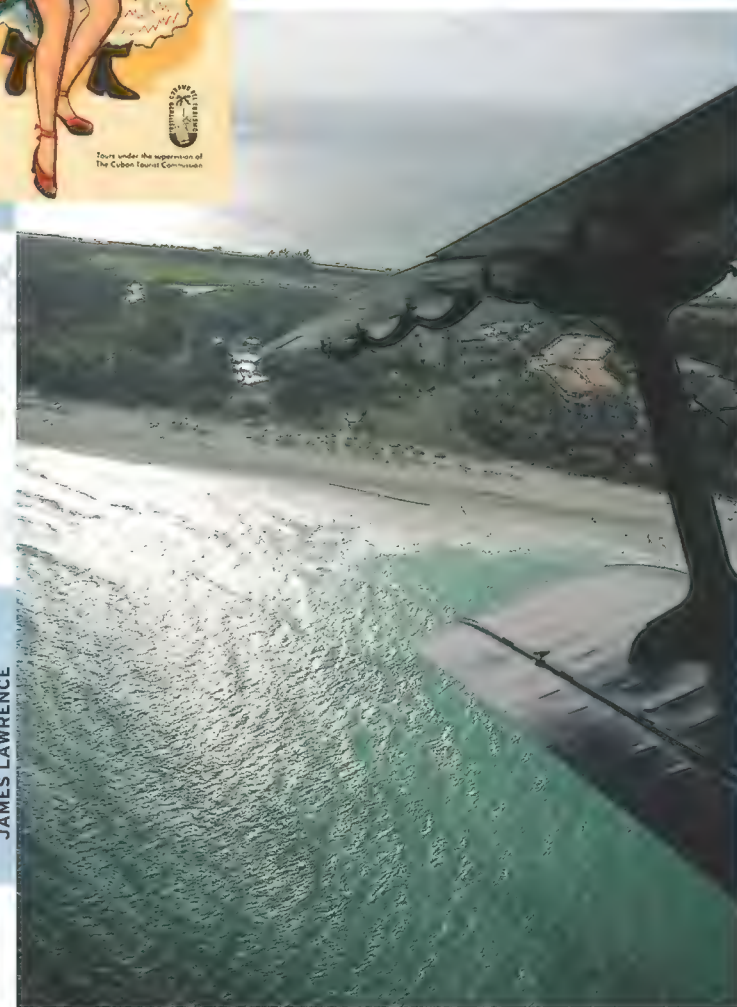
Flight in Cuba today is military aviation. The Cuban mil-



The Cuban coastline shimmers beneath the wings of an Antonov An-2 (right), used for domestic transportation.



Rancho Boyeros airfield (above) in 1937 had become Jose Marti airport (right) by 1947.



Pigs, and finally the Soviet involvement. Not to mention that there was no more private property. You couldn't own a private car, much less a private plane.” Adds Rodriguez: “Cuba is still a centralized Soviet style system where the state owns and runs everything. There is no private *anything*.”

When I last saw it in 1999, the grass field near Havana where Diaz and *La Estrella Errante* took flight was a weed-strewn open lot, and the fate of that homebuilt airplane was unknown. Some say it was shipped to a military airfield in Cuba. “We heard it was there in mothballs,” Alba Diaz told me later. “But we don't know for sure. Someone else said the plane had been left outside on a tie-down and simply rotted.” Covered with house paint, its primitive construction “would not have stood up very long outside,” her father agreed.

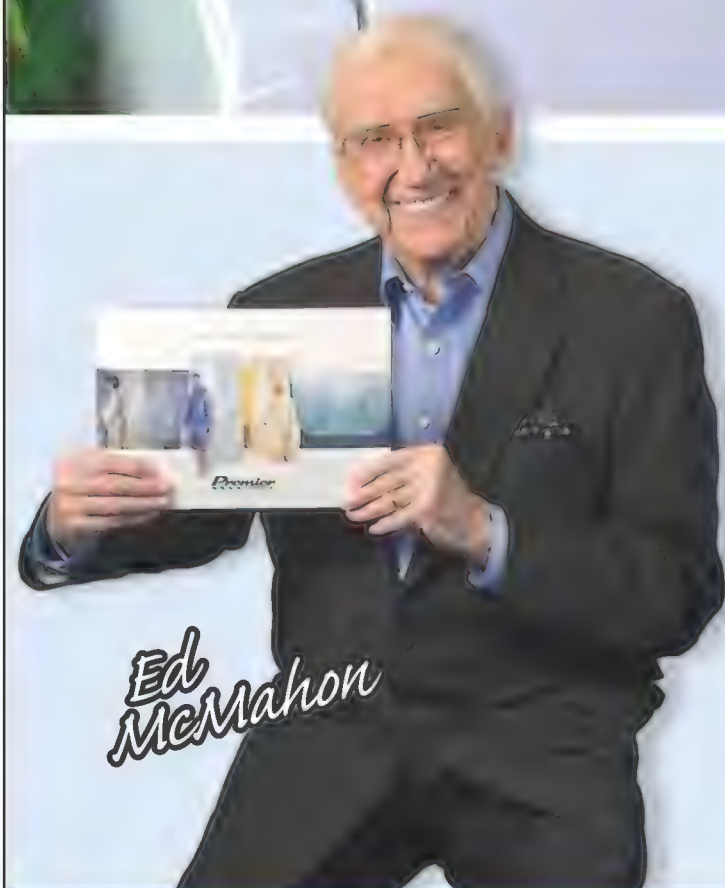
All around the island, the airports and flight schools that once sparkled with the glint of paint-

itary makes no secret that it owns Gaviota, the Cuban tourism agency, which in turn owns the hotels and night clubs on the island. Gaviota also owns the domestic airline, whose Antonovs and Ilyushins are flown by military pilots, the only type of pilots still trained in Cuba. “When you step aboard a Cuban airline,” Rodriguez says, “the air crew will be MiG pilots.”

Across the island, American cars from the 1950s—wire-tied and cannibalized—still sputtered along the roads. Left behind by their owners, the cars had become the property of the state, on loan to those the government favored. But in the skies over Cuba, there were only jumbo commercial airliners, the old Antonov and Ilyushin transports, and the contrails of MiG-29s. —

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Death at 25,000 Feet

The dangers faced by young aircrews on heavy bomber missions during World War II.

Masters of the Air: America's Bomber Boys Who Fought the Air War Against Nazi Germany

by Donald L. Miller. Simon & Schuster, 2006. 669 pp., \$35.

WORLD WAR II COMBAT took the lives of more U.S. bomber crew members than U.S. Marines. The Army Air Forces lost some 10,000 four-engine bombers, each typically manned by a crew of 10. Never before had warriors fought at 25,000 feet, where supplemental oxygen was needed to stay alive, temperatures plunged far below freezing, and the sky was filled with Luftwaffe fighters and anti-aircraft fire.

Today we can only imagine what it was like to be inside a heaving Boeing B-17 Flying Fortress or a Consolidated B-24 Liberator with no pressurization, no protection from enemy fire, and no respite from incessant vibrations and noise—all while hauling bombs to strategic targets deep inside Third Reich territory.

Being one of the “bomber boys” was the second most dangerous assignment given to American service members during the war, its perils



exceeded only by those of submarine crews on Pacific war patrols. The risks changed as the war wore on: In early days, a crewman who survived a bailout could expect reasonable treatment as a prisoner of war. Later, he was as likely to be murdered by those he'd been bombing.

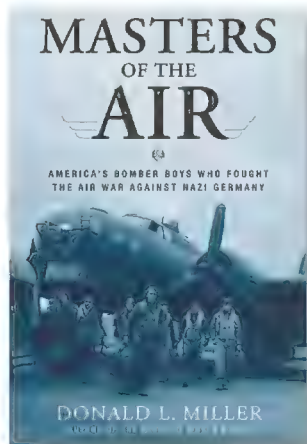
Author Donald Miller teaches at Lafayette College in Pennsylvania. He has hosted a television series on American biography and written four books with war themes.

In *Masters of the Air* he achieves a

A U.S. Army Air Forces Consolidated B-24 Liberator meets a terrible fate after being fired on by the cannon from a Luftwaffe Messerschmitt Me-262.

historic standard equal to the best of Stephen Ambrose, Douglas Brinkley, and Stanley Weintraub. Miller's many interviews with veterans yield fresh voices and new insights into a subject that has been extensively covered, though perhaps never in such human terms.

■ ■ ■ ROBERT F. DORR IS A U.S. AIR FORCE VETERAN AND A COLUMNIST FOR THE NEWSPAPER AIR FORCE TIMES.



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From POW to Blue Angel: The Story of Commander Dusty Rhodes

by Jim Armstrong. University of Oklahoma Press, 2006. 297 pp., \$29.95.

COLLEGE ENGLISH

professor Jim Armstrong has written a book that moves along at a steady clip as its subject, Raleigh "Dusty" Rhodes, braves Japanese imprisonment during World War II, leads the U.S. Navy flight demonstration team, the Blue Angels, and flies missions in the Korean War.

Though a biography, Armstrong's account reads more like a novel. *From POW to Blue Angel* is based mostly on interviews with Rhodes and other pilots, as well as Rhodes' personal scrapbooks and letters. Reading it is like sitting down with Rhodes over dinner as he outlines his exploits in between bites of steak and sips of wine, which is



exactly how the author began his research and was persuaded to write the book.

Toward the end of the war, Rhodes and his fellow prisoners survived Boeing B-29 bombing raids flown near the camp where they were held. Once released, Rhodes received \$6,000 in back pay. After the war, Rhodes assumed leadership of the Blue Angels as its pilots grappled with transitioning from the propeller-driven F8F Bearcat to Grumman F9F Panther jets. During those early days, the team pilots

invented some of the basic maneuvers that the Blue Angels still fly today.

If I can't share dinnertime conversation with Rhodes, Armstrong's well-chosen details and tight storytelling are surely the next best thing.

■ ■ ■ JOHN SOTHAM IS A FORMER AIR & SPACE ASSOCIATE EDITOR.

>>> Out of the Vault <<<

Airport DVD. Rated G. Universal Studios, \$15.95.

VIEWERS WHO WATCH *Airport*, which came out in 1970, will be reminded of a time when women wore fur coats without shame, cigarettes were cool, and American-made station wagons ruled the road. A well-paced guilty pleasure, *Airport* looks in on a busy Chicago airport trying to stay operational during an evening blizzard: The most pressing problem has aircraft maintenance chief Joe Patroni, played by George Kennedy, trying to clear a runway blocked by a Boeing 707 stuck in deep snow. Inside the terminal, we are acquainted with passengers arriving for an overnight flight to Rome, including a chronically unemployed depressive, played by Van Heflin, who is carrying a bomb in his briefcase. His plan is to blow up the airliner so that his wife can benefit from the \$225,000 worth of traveler's insurance he purchases at an airport kiosk. In the G-rated film, the characters utter not a single profanity; various subplots, though, have them engaging in adultery, stealing, and smuggling. A married airline captain, played by Dean Martin, has impregnated hottie stewardess Jacqueline Bisset, who tells Martin, "I won't make things difficult for you."

After the airliner reaches altitude, Heflin's character detonates the bomb, killing himself and damaging the aircraft, which the pilot then quickly flies back to Chicago for an emergency landing. "We're gonna crash," says a panicked passenger, whereupon a priest reaches across the aisle and slaps the man into submission. The film's climax comes as Patroni struggles to free the mired 707 in time for Martin to land his crippled airliner. This scene alone is reason enough to watch *Airport* – again.

■ ■ ■ DIANE TEDESCHI IS AN ASSOCIATE EDITOR AT AIR & SPACE.



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R.L. Creighton flew his P-40N to Anchorage in July 1941, and a P-38L to Shemya in August, just in time for the war to end.

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Michael Milstein is a frequent *Air & Space* contributor.

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Russia's Long Love Affair with Space. Asif Siddiqi is an assistant

professor of history at Fordham University in New York City.

Calling All Mustangs. Frequent contributor Stephen Joiner writes about aviation from his home in southern California.

Northern Exposure. Charles Petit has reported on space science for more than 35 years.

An Airplane in Every Barn. Giles Lambertson is a retired journalist and former Kansas farmboy whose father was a Flying Farmer.

Magic Airport. Contributing editor Chad Slattery posts his photographs at aeropix.com.

The Country Where Nobody Flies. Rafael Lima, a Civil Air Patrol captain, teaches writing at the University of Miami in Florida.

Coffee, Tea, or a Knuckle Sandwich?

LONG GONE ARE THE DAYS when airline cabin crews were called “sky girls” or “stewardesses” and considered little more than flying waitresses. Today’s flight attendants are an integral part of the crew—first responders in emergencies that the flying public has braced for since the terrorist attacks of September 11, 2001.

The Federal Aviation Administration recommended in January 2002 that any passenger disturbance, “even those seemingly harmless, should be considered suspicious; it could be a diversion for more serious acts.”

For flight crews dealing with hostile passengers in the past, “it used to be about appeasement,” says Bill McGlashen, assistant to the international president of the Washington-based Association of Flight Attendants, which represents 55,000 flight attendants at 20 airlines. “But there’s been a sea change. We went from being told to cooperate with hijackers until the feds could take over to being trained in defense techniques. Now, it’s ‘Protect the flight deck at all costs.’”



The new rules marked a turn in a profession now more than 75 years old. Early flight attendants had to endure unpressurized cabins at turbulent altitudes, sometimes serving meals on their hands and knees because the flight was so rough.

But nothing changed the profession as much as the 2001 attacks, when 25 flight attendants were killed on the four hijacked airplanes—two from American Airlines and two from United. Crews had always been trained

For flight attendants in the past, appearance was paramount, from well-coifed hair to polished shoes.

in emergency evacuations and inflight medical problems, but preparing to wrestle a terrorist into submission was a new twist. Flight attendants are now taught to protect the flight deck and cabin using whatever tools are at hand.

There are two types of training classes. The Transportation Security Administration offers a voluntary, one-day class in self-defense, taught by federal air marshals, at 10 community colleges around the country. So far, about 1,750 flight crew members, most of them flight attendants, have taken the

course—at their own expense—since it began in 2004. Airlines also include self-defense in their required annual training for the nation’s 120,000 flight attendants. But that part of the eight-hour class, taught by flight attendant-instructors, can last from 15 minutes to an hour and a half—too brief to deal with all potential threats, says Candace Kolander, AFA’s air safety, health, and security coordinator. “We’re not saying we should be martial arts experts, but you have to have realistic self-defense training,” she says. “A better way would be to just make the recurrent training longer by a day.”

One important factor in self-defense is how the galley is set up, says McGlashen, a Southwest Airlines flight attendant since 1989. “You have to know where the heavy wine bottles are, the corkscrew, maybe a heavy serving tray. It’s kind of like an old kung fu movie. We also know that our passengers won’t be passive. That kind of vigilance on the part of passengers gives us a sense of empowerment.”

■ ■ ■ BETTINA HAYMANN CHAVANNE



Today, self-defense is part of the training. Sandy Berry (left), a flight attendant for American Airlines, throws a punch at instructor Janet Taylor at a martial arts school in Moon, Pennsylvania. Berry began the classes after 9/11.

Moments & Milestones

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Captain Markle's Mackay

THE MACKAY TROPHY, established in 1911 by Clarence Mackay—aviation enthusiast, philanthropist, and head of the Postal Telegraph-Commercial Cable Companies—is a stately piece of silver. And it has been awarded, in conjunction with the National Aeronautic Association, to aviation

stationed temporarily while the runway is being repaired at his home base, Spangdahlem Air Base, Germany.

The Mackay Trophy recognizes your heroic flight over southern Afghanistan on June 16, 2006. Can you tell us more about what happened that day?

I led a two-ship of A-10s from Bagram Air Base, Afghanistan...when we were [sent unexpectedly] to the Afghanistan-Pakistan border to support a 15-person foot patrol of U.S. special forces [who came up against] over 40 Taliban fighters. We arrived 30

passes. Each time the A-10 passed overhead, the Taliban stopped firing, and the special forces team pulled back until they were 100 feet away from the enemy. At that point, Markle was authorized to use his 30-millimeter gun, which provided the team enough cover to draw back even farther. Markle was authorized to drop his 500-pound bombs, but initially resisted because of the proximity of the team—the bomb burst can reach 1,300 feet.

I agreed to drop the bombs only if the team took cover behind a group of rocks. Once the team was safe, we dropped two bombs on the enemy, ceasing all remaining enemy fire.... All 15 special forces members made it out alive.

Did you always want to fly when you were a kid?

My father retired from the Air Force as a lieutenant colonel when I was eight years old. I don't remember much about the military lifestyle, but my family always attended the annual airshow at Offutt Air Force Base, Nebraska. I've been fascinated with airplanes my whole life, but it wasn't until my sophomore year in high school when Operation Desert Storm started that I decided I wanted to join the military. I attended Texas Tech University and was lucky enough to receive a pilot training slot after my junior year. Following pilot training at Vance Air Force Base, Oklahoma, I was selected to fly my number-one choice, the A-10; [I've been flying it] since 2000.

Which aircraft would you like to fly? And what has been your favorite during your career?

The answer to both questions is the P-51 Mustang. When I fly missions over Europe, I often wonder what it must have been like to fly the P-51 during World War II. I would love to own a P-51 someday, but they are pretty expensive.

■ ■ ■ BETTINA HAYMANN CHAVANNE



An A-10 Warthog from the 81st Fighter Squadron sips fuel from a KC-135 tanker.

giants like General Henry "Hap" Arnold (the first recipient, in 1912) and World War I ace Eddie Rickenbacker for the most meritorious U.S. Air Force flight of the year.

This year's recipient, Air Force Captain Scott Markle, e-mailed *Air & Space* recently about the events that earned him the honor. He wrote from Lakenheath Air Force Base, England, where the 81st Fighter Squadron is

minutes before sunrise, and with our night-vision goggles we could see rocket-propelled grenades, heavy machine guns, and small arms fire coming from three mountain ridges that surrounded the special forces team.... The team's radio controller informed us they were engaged in hand-to-hand combat with the enemy on the valley floor and were taking direct hits from the enemy above.

The enemy was too close to the special forces team for the pilots to use their weapons, so Markle made several low